AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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Improved Screw-Cutting Engine Lathe.

It would seem, when we consider the many improvements which have been made in the engine lathe during the past few years, that further progress in that direction would be impossible. Evidences, however, occasionally appear which prove that this is not the case.

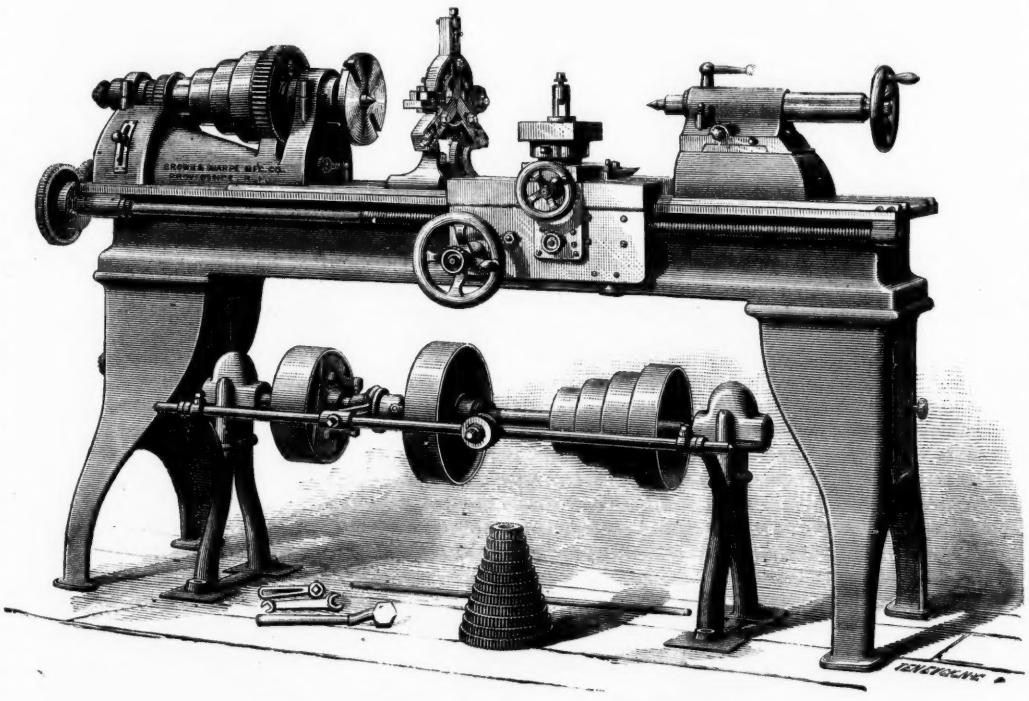
We illustrate herewith a new lathe, manufactured by the Brown & Sharpe M'f'g Co., of Providence, R. I., which contains, beside the well known devices of those in common use, others which render it especially desirable for use in a tool room, or for any fine and accurate work. It is driven by a $2\frac{1}{4}$ in. belt, and is strongly geared, the gears which are usually placed at the back of head (usually called the back gear), being underneath it and entirely enclosed, making a neat and cleanly arrangement.

They are thrown in and out of gear by means of the lever shown directly under the spindle at the front of head.

The spindle and boxes are of steel, hardened and accurately ground. The boxes have means of adjustment in case of wear, and are self-oiling. The journals are 2 inches in diameter and 4 inches long. The spindle has a hole through its center $\frac{3}{4}$ of an inch in diameter, which is a convenience when the lathe is used for cutting up stock, or for finishing the ends of long work. The carriage is gibbed to the bed, and has a clamp screw to hold it firmly when using the cross feed. It is also planed to a level surface on the top, and has T slots, to insert the heads of bolts, for convenience in holding work to the carriage, for boring.

The screw and change gears will cut all threads from 3 to 16, and nearly all from 16 to 48 per inch. The split nut upon the screw is opened and closed by a hand-wheel underneath the apron. The tail-stock is also gibbed to the bed, and having a cam fastening which is quickly operated, it can be moved on the bed without the annoyance usually experienced on other lathes in tightening and loosening the bolts. The hand-wheels operating the carriage, cross feed screw, and tail stock spindle, are graduated on their hubs. Suitable closets arranged for holding the change gears, wrenches and tools, are fitted in the legs.

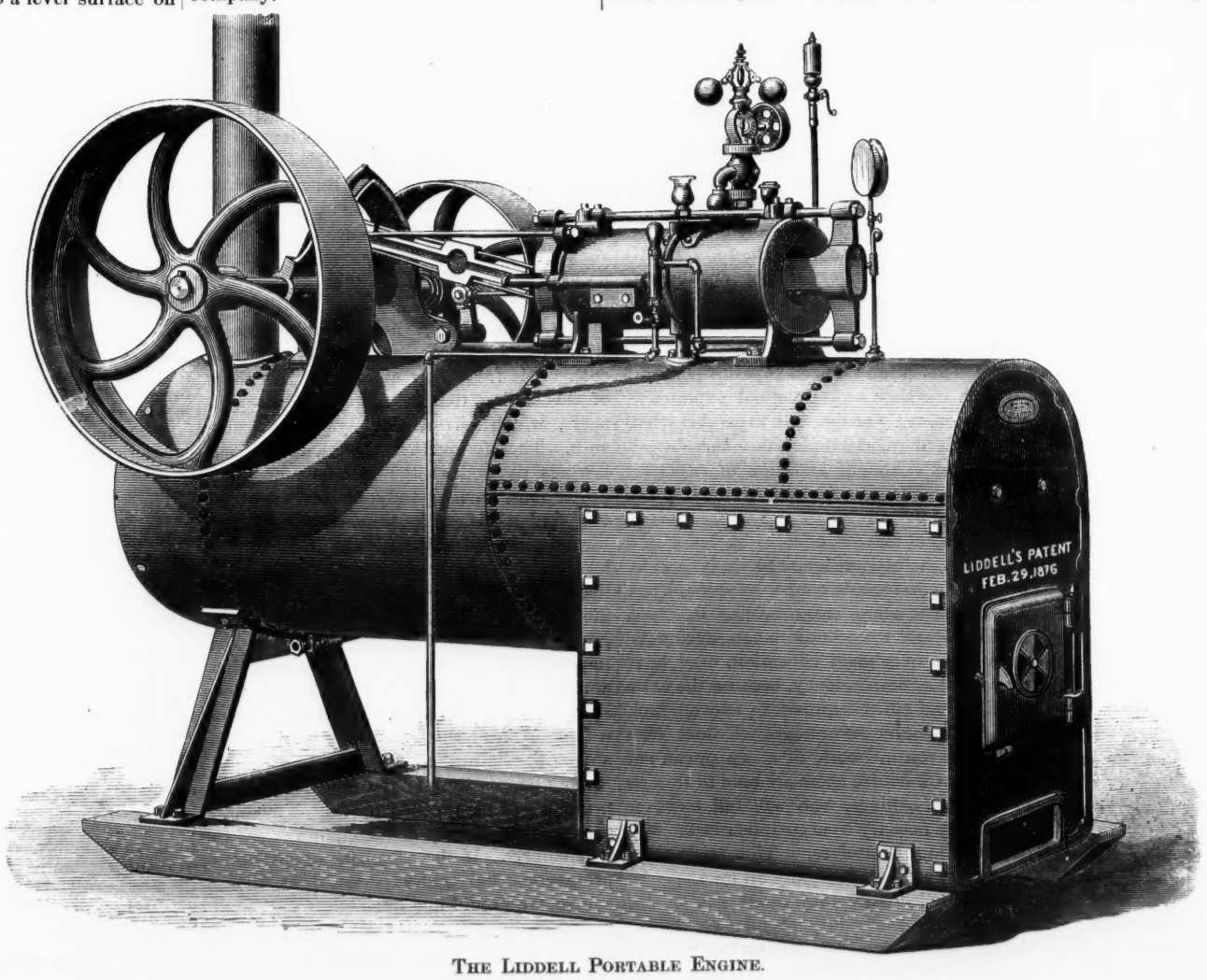
The lathes will swing over the bed 16 inches, and over the carriage 11 inches, and the one with 6 feet bed will take 2 feet 10 inches between centers. Each of these lathes is furnished with overhead works, center rest and everything shown in the illustration. This lathe, in addition to the above features, possesses the excellent finish which is one of the peculiar characteristics of all the tools manufactured by this well known company.



NEW ENGINE LATHE, BY BROWN & SHARPE M'F'G CO.

Liddell Engine and Boiler.

The endless variety of portable engines which are offered for public favor by the many manufacturers throughout the country, each one claiming some peculiar merit, it would seem that the ground was all covered. Still, the best plan to transmit the power of steam from the boiler to the work to be performed is exercising the brain-power of some of our best mechanical engineers continually; and from time to time some important changes are made and some new device announced to save fuel or expense of manufacture, etc. The inventor of the engine and boiler here illustrated claims to have brought out something entirely new, making an entire change both of boiler and engine, and adding to their value, making it simple, durable, effective, and safe.



THE LIDDELL PORTABLE ENGINE.

This engine is the result of long experience, much labor and expense, and is furnished at a reasonable cost for any service desired.

This engine dispenses with the following objectionable features of the old style :

First. With the cross-head and slides, objectionable because they add to cost and cause friction.

Second. With the cylinder-heads, objectionable because they conceal imperfections. In this engine there is nothing concealed. Imperfect or slighted work is bound to show, and the engineer will at all times know when his engine is in need of repairs.

Third. With the stuffing-box, objectionable because it creates friction, consumes packing, and requires time and attention.

Fourth. With the heavy bed plate. The builder has strengthened the engine, and taken all undue strain from the boiler by means of the two parallel stay-rods connecting the cylinder with the pedestals above the center line of strain.

Fifth. He has constructed his connecting-rod so as to use jam-nuts in place of gib and key, thus making it more easily adjusted, especially by an inexperienced hand.

The pistons are connected together by two rods outside of the cylinder, the weight being carried by the upper rod. This rod is supported by adjustable bearings on each end of the cylinder, thereby insuring an even wear in the cylinder. The two pistons are held firmly in a rigid line, and perfectly parallel to each other.

The steam is admitted and discharged from center of cylinder, through short and straight ports, saving a large percentage of steam, which is wasted in the side-pipes by the ordinary way of conveying steam to the ends of the cylinder.

The cylinder is surrounded with a live steam-jacket, and takes

steam from same to the cylinder, giving a uniform temperature, and doing away with condensation, it being perfectly safe to start up with full throttle.

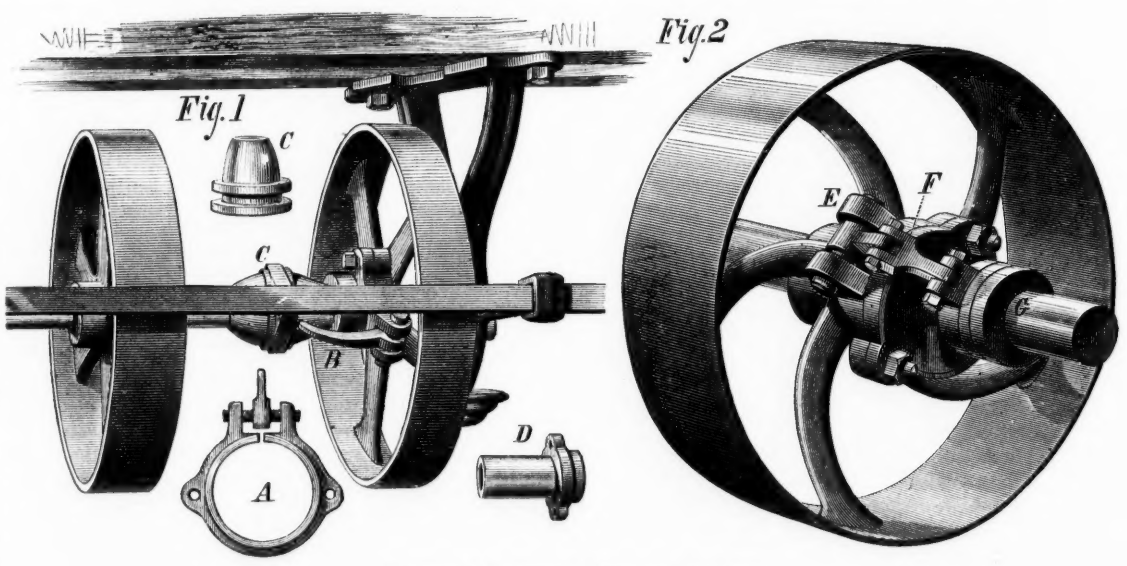
The superiority of this style of boiler is conceded. One of the greatest improvements in this boiler, is the dispensing with the flat crown sheet and furnace sides, which, being the weakest and most exposed parts of the ordinary style of portable boilers are the source of greatest danger.

In this boiler there is no flat crown-sheet to wear out; no stay-bolts to give way; no furnace sides to fill with sediment and give out; but it is as safe as a stationary boiler, and no more subject to injury from low water. The furnace is large, and the sides are lined with fire-brick, which can be replaced when worn out, and all parts of the boiler are easily accessible for cleaning and repairs. It has but one seam exposed to the fire.

This engine and boiler are manufactured by the Jersey City Machine Works, Jersey City, N. J., and the Liddell Engine Co., Charlotte, N. C.

Hunter's Patent Friction Clutch Pulleys.

We illustrate this week two new forms of friction clutch pulleys, recently brought out by Jas. Hunter & Sons, North Adams, Mass., which have gained very favorable notice from machinists where they have come into use. In these pulleys a friction band is employed to clutch the boss or friction surface of the wheel—and the means for operating the band are both simple and efficient; in the form shown in figure 1, the pulley is placed on the sleeve *D*, which is secured to the shaft, and is provided with a flange for receiving screws which enters friction band *A*, the latter surrounds an enlarged boss or friction surface of the wheel, and is split and provided with two ears through which passes a bolt having a cam formed on its head that engages a similar cam formed on one of the ears. A lever *B* is secured to this bolt and is curved so as to be engaged by a cone *C* on the shaft, the cone is grooved circumferentially to receive the fork of the shifting lever; it requires very little effort and only a slight movement of the shifting lever to operate the clutch. This device is applicable to all light work, also lathes and other machinery requiring a forward and back motion.



HUNTER'S FRICTION CLUTCH PULLEYS.

By moving the cone *C* towards the pulley the free end of the lever *B* is thrown outward, the ring *A* is contracted and the boss or friction surface of the pulley is clamped so that it is carried around with the shaft.

The friction clutch, shown in figure 2, is similar to the one just described, the difference being that a right and left hand screw passes through the ears *E*, and is turned so as to contract the split ring by the action of the toggle *F*, when the sleeve *G* is moved towards the pulley, enabling it to exert great power, in contracting the band on to the friction surface of the pulley; and by moving either the cone *C* or sleeve *G* away from the pulley, releases it. This pulley is adapted to either light or heavy work. The following special advantages are claimed for these friction clutch pulleys. That they excel in simplicity and durability; that machinery can be started without shock or jar with shafting running at full speed; that the motion being easy, it requires very little effort to throw the friction in or out; they are so constructed that the pulley can be easily oiled while in motion; that they cost less than any other friction pulley in market.

The citizens of Peoria, Ill., are going to form an association for the purpose of encouraging all enterprises of a manufacturing or other nature that will tend to increase the population and progress of that city.

The Engineer.

BY STEPHEN ROPER.

Engineering has assumed such vast proportions as an agent of modern progress and civilization that it has given birth to a great variety of professions whose scope and functions are not, as yet, very clearly defined. Formerly the engineering profession was designated under four heads: Civil, Military, Sanitary, and Mechanical, but at the present time it includes Hydraulic, Mining, Dynamic, and Steam.

In consequence of being a member of the latter profession, we will be pardoned for making the steam engineer, as he is frequently called, whether aptly or not, the subject of our remarks in the present article. The steam engineer's duty in the performance of his daily routine involves the application of the laws of nature in various ways, to understand and explain which requires a wide range of scientific knowledge. While there are to be found in the profession thousands of men whose intelligence and acquirements would shed luster on any calling, there are others, who, by their loose disregard of correct rules, show that they are laggard in the acquisition of that real knowledge so essential to men in their profession. This is to be regretted, in view of the vast amount of property, and the great number of valuable lives entrusted to their care, both on sea and land. But whenever any attempt is made to induce engineers in general to qualify themselves for their calling, the effort is met with the old stereotyped question, regarding the relative merits of theoretical and practical engineers, or the comparative value of theory and practice. The practical men, who have no theoretical knowledge, scoff at the theorists, and the latter sneer at the former. It requires very little experience on the one hand, and not much study on the other, to show that both are equally important, only in different ways. Both parties should know that "Theory and Practice make perfect." Theory, together with practical experience, will undoubtedly enable men to excel in whatever work they may undertake; therefore it should be the highest ambition of engineers to combine theory with practice, and prove the one by the other.

This object may be effected by devoting a portion of their leisure hours to study, and by pursuing a systematic course of self-culture. The engineer whose early training has been neglected, and who is now debarred from the advantages of a good education, need have no cause for despondency, because the extra exertion and effort required to educate himself, will confer advantages of their own which the routine work of a school can not develop. Of course there are men in this, as in all other callings, who will fail, however much they may try to accomplish in the way of educating themselves. This arises from the fact, that, though legally all men may be equal, intellectually they never can be so. Consequently the ability of men to educate themselves varies in proportion to the amount of natural intelligence they possess. But in any case study gives quickness of apprehension, enables a man to profit by all the recorded experience of others, develops a power of appreciation, and concentration, enforces exactness and accuracy, and, if properly directed, teaches men to classify facts, make proper deductions, and reason logically. The knowledge acquired from the study of books is of inestimable value to the young engineer, as without it he can never be thoroughly qualified for the duties of his profession, since he will be lacking in certain definite information, which can only be obtained from them, owing to the want of which he is almost sure to be not only narrow-minded, but also very slow to receive new ideas, or to estimate the proper value of old ones.

Such persons, if occupying positions in which they exercise authority, are very apt to become intolerant of other people's opinions, to assume that all knowledge begins and ends with themselves, or with what they have learned, and to overestimate their own ability. They are apt to be self-conceited, a quality which too many in every calling possess, mistaking it for an independent spirit. One of the commonest excuses for ignorance is the stereotyped expression, "I am too old to learn." This, if made in sincerity, is a great mistake, as it is a false pride which neglects an opportunity to learn because it comes late in life, and it is a false fear which shrinks from an effort on account of its difficulty. One fact very important to be considered in this connection is, that knowledge throws light upon itself, and that it is the first step only that must be taken gropingly, as it were in the dark, as the bugbears in such cases, like shadows, vanish the moment they are boldly approached, and will be found to be mere shadows after all. Truths are in the main simple and easy to be understood, and are daily being brought more within the grasp of the most ordinary comprehension by means of good books, and scientific papers, which can be purchased at a very moderate cost. It is frequently asserted by members of this calling, that they are no book engineers, which statement betrays their ignorance. They forget that though doctors and lawyers, as well as the members of other professions, have to study for several years, they find it necessary to accumulate large libraries and subscribe for the medical and legal journals of the day; as books furnish them with the precedents of the past, and the scientific papers and periodicals of the present day keep them well versed on the improvements, discoveries, and changes that are taking place in the details of their profession. How can any man claim to be a competent engineer who never invested $1.00 in any work relating to his trade, or subscribed for any paper, that is the exponent of the principles of his profession, and the medium through which they are communicated to its members. If the members of all other professions and trades persisted in such a course, we should find ourselves a nation of barbarians in less than a quarter of a century.

Most of the abuses connected with steam engineering have arisen from two causes, viz., avarice and ignorance, on the part of owners of steam engines and boilers, who entertained the idea that cheap steam engines and boilers might be managed by a class of persons who were willing to work for very low wages. The question was not how much water the engineer could evaporate with a ton of coal, as it was how much work the employer could get out of the engineer. The owner of a steam engine in this city refused to subscribe for the AMERICAN MACHINIST on the ground that his engineer would soon be reading it. He once had an engineer that was willing to sweep the yard or clean bricks; he began to study these thundering scientific books and papers, after which he would do nothing but take care of his engine and boiler. But this is not an extreme or an isolated case; there are thousands of the owners of steam engines that would prefer to have their engineers ignorant and uneducated rather than to have them intelligent. It is evidently one of the greatest mistakes connected with the use of machinery to intrust its care and management to persons of inferior judgment, as a competent engineer who could command good wages would probably save three times the difference by judgment and skill in its proper maintenance, but it is very difficult to make the owners of steam engines believe it.

If engineers wish to raise the standard of their profession to what it ought to be, and command remunerative compensation for their services, they may do so by educating themselves and not otherwise. It will not do for them to "shrug their shoulders," and claim to be practical men, because it is well known that such men have become a nuisance in every branch of mechanics, being the least progressive, the least enlightened, and the most stubborn, in the assertion of their views, because their minds are cramped and will not allow of either the substitution, or the admission of ideas different from their own, however crude and primitive they may be. Nevertheless, such persons are always ready to thrust themselves forward, and can easily be distinguished by the profuse use of the pronoun "I," which is evidence of conceit or ignorance, or perhaps of both. A great deal has been said and written on the subject of licensing engineers, but there still seems to be as great diversity of opinion as to the benefit to be derived from it, as on any other connected with the profession. Many engineers are of the opinion that in consequence of the loose and uncertain way in which examinations for licenses are now conducted, a law that would require every engineer to submit to a rigid examination would prevent all but first-class men from being employed as engineers. But while all agree that there should be a license law to reach all classes of engineers, there are more formidable difficulties to be overcome in the impartial execution of such a law than appear at first sight, which will be made the subject of another article.

The Sinking Fund Commission of this city gave permission, June 20th, to Gen. F. B. Spinola and his "Associates" to lay under the streets south of Canal street the mains and pipes necessary to furnish steam to buildings and dwellings under the Holly combination system. For this privilege the General and his "Associates" must agree to pay to the city three cents for each lineal foot of pipe laid, until the payments reach $150,000, and in every year in which their earnings exceed ten per cent. of the sum invested, to pay the next three per cent. earned in the same year over the ten per cent. They must further agree to supply the steam required by the city for heating the public buildings, or any other purpose, at twenty-five per cent. less rates than steam is furnished by them to their most favored customers, and to furnish steam at reasonable rates to clean the streets from snow and ice, and for the use of the fire engines. The General and his "Associates" will also have to give a bond for $50,000 as a guarantee that the street pavements shall be restored after the pipes are laid.

Concerning Iron Castings.

The crystals of iron are octahedra, that is, composed of two four-sided pyramids, base to base. In some varieties of cast iron they are very large and clearly pronounced; in others, fine and indistinct; while in some they are almost or quite untraceable. What is remarkable is, that different castings, made of one variety of pig, will show various grades of crystallization, and different parts of the same casting will vary as much. In fact, the shape of the casting, the material and disposition of the mold, and the manner of pouring, so materially affect the formation and disposition of the crystals, as to bear very directly upon the strength and accuracy of the casting.

When liquid cast iron is poured into a mold and solidifies, the crystals tend to arrange themselves with their principal axes perpendicular to the cooling surfaces of the mold. (This is equally true of sulphur, ice, spermaceti, or any other crystallizible material). When the cooling of the mold is accomplished very rapidly, these crystal lines are deeper and better defined, the most marked instance being where the mold is of cold cast iron, in which case the "chilling" influence is seen to perfection, and to a depth of from one to two inches.

Now, all the crystal lines extend largely in lines perpendicular to the cooling surface of the casting; and as they largely determine the strength of the casting, it is important so to design and mold our castings as to bring these lines into directions favorable to strength.

Fig. 1 shows some of these crystals magnified and of a better form than the average. Fig. 2 shows their arrangement in lines perpendicular to the cooling surface, in a casting of cylindrical section. In Fig. 4—a block of square section—there are intersecting planes crystal lines, and these are lines of weakness. In Fig. 5, of rectangular section, the lines of weakness are not the diagonals as in Fig. 3, but diagonal and a central joining line. If castings be made by skill, not possessing these characteristics, heating them quite hot and allowing them to cool will cause their appearance, with the attendant disadvantages.

Where large flat flooring plates are cast "open,"—that is, with no top surface for the mold,—the tendency is to crystallize as in Fig. 5, mostly on the under side. This would cause unequal strains on the top and bottom faces of the plate, and buckling or cracking, or both; and it is obviated by strewing sand as a "cooler" upon the top surface the moment it ceases to be liquid.

Where there is a thick and a thin portion of a casting, the thick portion cools slower than the thin and there is danger of cracking at any time. These destructive changes must be obviated; and by reversing the sand-strewing process, that is, by uncovering a thin portion likely to cool too fast by contact with the sand of the mold, the trouble may be avoided.

In a water pipe, or cylinder cast hollow, the lines are as seen in cross section in Fig. 6.

In Fig. 7 is seen in longitudinal vertical section the cylinder of a hydraulic press, as built at first—square bottomed. The intersection of the crystal lines gave a conical plane of weakness in the bottom, and the bottoms burst out quite regularly. This was afterwards remedied by casting the bottoms rounding as in Fig. 8. The Germans have another way of getting around this difficulty—casting the cylinder *bottomless* and facing off the bottom square and true so as to permit of a separate circular bottom piece being applied.

It will thus be seen that the addition of a square fillet or band on a cylinder (such as a cannon) may really weaken it by causing weak planes of crystalline intersection; and that if a fillet or band be really necessary, it should have no angles, but should swell gradually by gently curved lines, from the main body of the casting. Neglect of this point has caused failure of many a casting, otherwise well designed.

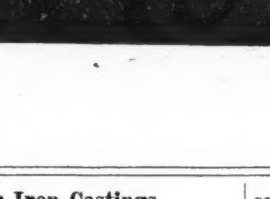


Fig 1

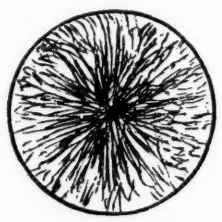


Fig 2

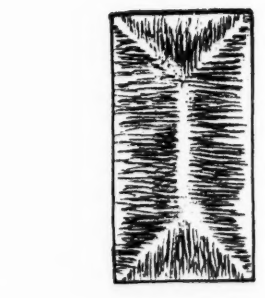


Fig 3

Fig 6

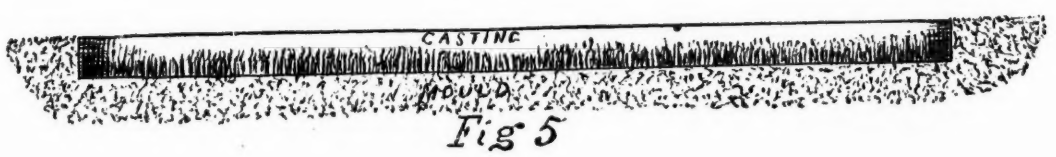


Fig 5

Fig 4

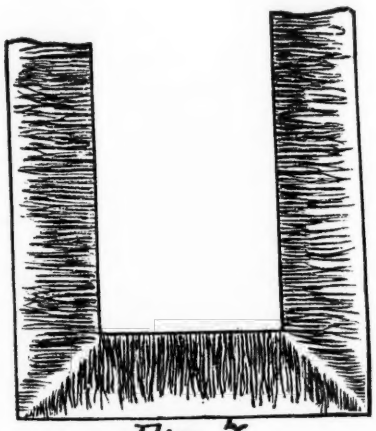


Fig 7

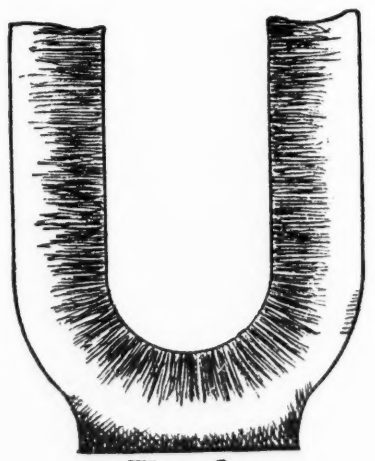


Fig 8

To Find the Horse-Power of Engines.

One horse-power is raising 33,000 pounds one foot high in one minute. Before the introduction of the steam engine, it was found by experiment, that, with the average of horses, the best speed for work was at the rate of two and a half miles an hour, and at that rate of speed a horse could raise, perpendicularly, a weight of 150 pounds 220 feet high, in one minute which is equivalent to raising 33,000 pounds one foot high in one minute, and was taken by Watt as a standard for horse-power, and is universally received as such. To find the horse-power of an engine, multiply the area of the piston by the average pressure in pounds, less five pounds per square inch for friction; then multiply that product by the number of feet the piston travels per minute, then divide by 33,000. This will give the horse-power of the engine.

Another rule is this: Multiply the area of the piston by the boiler pressure, and this product by the travel of the piston in feet per minute; divide this last product by 33,000, then deduct 13 per cent. for friction and condensation.—*Exchange.*

It is well known that in the use of leather belting, heat and damp—two unavoidable conditions—exert an unfavorable influence upon the material. By the one, such belts are dried up and cracked; by the other, they are stretched unduly and have to be tightened, putting a strain on the shaft-bearings which they are never intended to sustain. Loss of power, extra wear and tear, and, worse than all, rapid deterioration of belts, are the consequences. There are some common remedies for these defects of beltings, chief among them being powdered rosin, which is applied to the inner surface, to make them "bite." This practice has a well understood termination—the rosin accumulates as a hard layer, which has to be removed sooner or later, not, however, before it has done a considerable amount of harm. The fine dust produced in some factories, as in grinding or saw mills, has a similar effect, settling on the pulleys, and forming a layer of dust which prevents proper contact and causes a loss of adhesion.

These drawbacks, says an English journal, can be obviated by the use of a semi-glutinous, semi-oily medium, such as has for many years been used in Switzerland, and is now being introduced in England; this compound, it is stated, besides securing the right amount of adhesion, has the valuable quality of preserving leather.

The price of skilled labor has advanced in Paterson, N. J., and more workmen are now employed in that city than ever before.

The Wrought Iron Bridge Co., at Canton, O., has received a contract for an iron highway bridge over the Minnesota river, at Mankato, Minn. It will have three fixed spans, each 113 feet 4 inches, and a draw-span 180 feet long.

The new steam excavator, recently completed for Mr. R. R. Osgood, by Townsend & Jackson, Albany, weighs about thirty tons. The shovel works toward the body of the machine, the bucket holding about two cubic yards.

The International Exhibition, Melbourne, Australia.

In the series of international exhibitions that of Melbourne, Colony of Victoria, is the most important for which manufacturers from this country are at present invited to prepare their exhibits. The exhibition at Sydney, New South Wales, will open in September of this year (now too late for entries), and a large part of the exhibits will be taken thence to the Melbourne Exhibition which opens October 1, 1880, and closes March 31, 1881. The Government of the United States has officially recognized the invitation to have this country represented at that important display of the choice products of various countries, and the Secretary of State has issued the following notice of appointment:

DEPARTMENT OF STATE,
WASHINGTON, D. C., June 27.

In accordance with the authority conferred on me by the joint resolution of Congress, approved June 10, 1879, I have appointed Dr. C. C. Cox, of the District of Columbia, to the position of Secretary to the Commissions intended to represent the United States at the proposed exhibitions to be held at Sydney and Melbourne, the former in 1879, and the latter in 1880. All persons desiring to exhibit at either or both of said exhibitions can communicate with Dr. Cox, in care of this department. Upon such application circulars containing full information and instructions will be promptly forwarded, together with necessary blanks. The Secretary of the Commissions proposes to leave this city for Australia about the 20th of July, proximo.

WM. M. EVARTS,
Secretary of State.

Our exports to Australia have increased wonderfully since the Centennial, and it is reasonable to suppose that our trade with the various colonies of that do main will double every few months, as it has done in the past. We would call the especial attention of manufacturers of machinery and machinists' supplies, to the value of having exhibits at the exhibition of 1880. American tools and machinery have only to be known to find a ready market in Australia against those they have been accustomed to buy from Europe. There are many importers of American mechanical supplies in the large cities of that country who are driving a profitable business. Melbourne is the metropolis of Australia, and had a population at the last census of 191,254 persons, or inclusive of a ten mile radius 205 000. Sydney had 75,945 persons, Ballarat, 47,156, Adelaide, 30,000, and Sandhurst, 25,000. There are numerous smaller cities where considerable manufacturing and mining operations are carried on.

The design for the Melbourne Exhibition Buildings, of which we show an engraving on this page, is the work of a firm of architects in Melbourne. The building is cruciform, consisting of a nave 500 feet long, running from east to west, and cut through its center by a transept 270 feet deep, the ends of which are north and south. This transept is the leading glory of the fabric. At its south end is the chief portal, a tall arch 40 feet wide and 60 feet high, deeply recessed and reached by a flight of broad stone steps. On each side are square towers 105 feet high, adorned with picturesque and well grouped windows. Some 50 feet behind the portico, and at the point where the transept intersects the nave, rises the dome, octagonal in form, and reaching the height of 223 feet. The proposed plan for the interior of the building insures light, air, and room, every advantage having been taken of former exhibitions.

MELBOURNE INTERNATIONAL EXHIBITION, 1880.

The buildings are located in Carlton Gardens, and will occupy, with the outlying grounds, about 60 acres. The contract for the building is for a little over $300,000, and it is to be completed on May 1st, 1880. No rent will be charged either for space, steam, or water-power, all exhibits admitted free of duty, and every facility given for sales. There are ten groups, following pretty generally the plan in Philadelphia, with 82 classes in all.

As the time is very short for making applications for space, we hope that many of our machinery men will avail themselves of the opportunity here afforded without delay, so as to make a creditable display from the United States and secure a large part of that trade heretofore monopolized by England.

All articles not patented will be secure from infringement during the year of the Exhibition.

A combination of iron and steel is made extensively in France, according to the *Revue Industrielle*, by running the metals separately into a mold, with a plate of thin sheet iron at the dividing line. In this way a perfect welding together of the two metals ensues.

New boiler works are in the course of construction at Windsor, Ont., by a Detroit firm.

The new corporation at Manchester, N. H., will be known as the Amory Manufacturing Company. It is estimated that the enterprise will add 5,000 inhabitants to the population of the city.

Our American Mechanical Engineers.

No. II.

WILLIAM WRIGHT.

The machine that deserves to rank above all others in the history of the world's mechanical progress is the steam engine. Always in the van of the march of civilization and enlightenment, the steam engine, in its various types of stationary, locomotive, marine and hydraulic, is the great motor that gives man control over inanimate matter and enables him to carry out the highest material improvements.

To improve and adapt the steam engine to its various classes of work, the best engineering talent has found studious employment ever since the days of James Watt. In no other country have these efforts met with such widely recognized success as in our own. The leading type of horizontal steam engine exhibited at every Universal Exposition since that of London in 1852, has been essentially the American. In the details of frame, bed, fly wheel, piston, cut-off, governor and full valve gear, the best engine builders of other countries have copied American models. Among the few men who have taken the lead in making these important improvements is William Wright, of Newburgh, N. Y., whose portrait we have the pleasure of presenting on this page. He was born in Wayne County, New York, in 1818, and received a common school education. At an early age he developed a natural mechanical genius, and at eighteen commenced to learn the trade of a machinist with John Daggett, of Newark, N. J. About this time he exhibited a remarkable genius and taste for steam-engineering by building a small engine in the cellar of his father's house, doing all the work by hand after having seen but one small engine before!

After remaining with Mr. Daggett two years and a half, during which time he was promoted to foreman of the shop, he went to Niagara Falls, and engaged in the repair shops of the Buffalo and Niagara Falls Railroad with the intention of becoming an engineer of that railroad, but was compelled to desist on account of ill-health. After recruiting his physical strength by a few months' vacation at home, he engaged in building steam engines with a Mr. Williams in Palmyra, continuing until 1842, when he removed to Rochester, and, associating himself with John Bush, carried on the engine-building business until 1845. In that year he invented a rotary steam engine, formed a partnership with F. Church, with whom he removed to Providence, R. I, and commenced to build the engine. This business terminated at the expiration of one year, Mr. Wright becoming fully convinced that there are mechanical impossibilities in the way of making a rotary engine equal in economy and durability to the horizontal or crank engine.

He next engaged for a short time with the Providence Tool Company, and afterwards with Corliss, Nightingale & Co., with whom he was employed in building steam engines until 1850. At that date Mr. Wright engaged to build a large condensing engine for Brown Brothers, of Waterbury, which was the first large engine ever used to roll brass in Connecticut, and to which was attached the first automatic cut-off regulated by the governor.

We next find Mr. Wright employed as general superintendent by the Woodruff & Beach Iron Works of Hartford, Conn., where he had charge of the designing building and erection of several large engines similar to the one built for Brown Brothers; also the large pumping engines for the Brooklyn Water Works, which contained improvements which he patented. He also obtained patents, while in charge of these works, upon an automatic cut-off engine for general purposes of power, which was there extensively built, and came into use in all parts of the country. This was one of the first practical working automatic cut-off steam engines ever constructed. It has always been a mooted question as to whom the credit properly belongs of devising the original four-rolling valve motion which almost revolutionized the steam-engine. Mr. Wright has in his possession an original sketch of this device, substantially as it was afterwards adopted and applied, which he made April 17th, 1849, and submitted to the head of the establishment where he was then employed. Whatever credit may justly belong to others (and Mr. W. does not assume the whole) in developing the idea, this much fairly belongs to him.

During the time he remained at the Woodruff & Beach Works he superintended the building and erection of the machinery of the Kearsarge and many other gunboats used in the war of the Rebellion. In 1863 Mr. W. resigned his position with that house and became an active member of the New York Steam Engine Co., building, during that time, many engines for Government boats. In 1866 he connected himself with Homer Ramsdall, of Newburgh, for the purpose of building his patented steam engines, receiving himself a salary and a royalty on the engines sold. In 1867 the firm changed, Mr. W. making the same arrangements with the new firm. Afterwards the Washington Iron Works became an incorporated company, Mr. W. remaining as general superintendent. In 1870 he formed with several partners the house of Wm Wright & Co., of which he is now the sole surviving member. He keeps the old works usually full of orders for building his improved automatic cut-off steam engines; also pumping engines, boilers, forgings, castings and general iron work. His compound pumping engines, lately built, for city water works have attained the highest duty ever placed upon record in a full year's running.

In person Mr. Wright is affable and unassuming. He possesses a vigorous constitution, and devotes his energies, without intermission, to the management of his business. He has always given careful attention to every new feature in steam engineering, allowing nothing of value to escape his grasp, and probably in the extent of his information upon this subject is excelled by no person living.

WILLIAM WRIGHT, OF NEWBURGH, N. Y.

Engine Bed-plates and Slides.

BANJO FRAME VS. RECTANGULAR TRUNK-BED.

Editor American Machinist:

Something over twenty-five years ago, one of the leading engine builders of this country adopted for an engine bed a style since very properly named by our English brethren a "Banjo Frame," from its similarity of form to the musical instrument of plantation renown.

Since that time, more than two-thirds of our engine designers and manufacturers have constructed their machines after the "Banjo" pattern; but I am pleased to see some of the well-known makers returning to the "Rectangular Trunk Bed," fifty years old in its general design, but now greatly improved in detail.

The object of the Banjo Frame was, it was said, to assure the greatest amount of strength, with the least amount of metal; the particular claim being, that all strains between cylinder and crank shaft were well-cared for by this particular form of bed; another claim was that it offered a cheap, simple, and durable slide. In regard to strains between cylinder and bed, hundreds of these engines throughout the country, after five or six years service, will show the claim *not* well-founded, by the irregularity of wear on cross-head, slides, crank pin, and main journal, caused by the continual springing of frame when under full load.

As for the slides, they *are* cheap, and that is *all*, I think, can be said in their favor. Most builders have followed the original designer, and have planed or bored the slides in the solid casting of frame, with no arrangement for adjusting the slides central and parallel with the center of bore of cylinder. True, they provided their cross-heads with an adjustment for wear; but this is of little or no account (when the slide-bars have no adjustment), as we all know that the slides receive their work in variable pressures from the cross-head, due to the angle of connecting-rod, and, consequently, the wear must be irregular on the slide surface. Within the past four years, the writer has examined over fifty engines of this type, and in all cases found the working-slide (according to direction in which engine was running) *worn to at least three different dimensions*, measuring from a line drawn through the center of bore of cylinder; this distance in some instances varying $\frac{5}{16}$ of an inch, and no possible way provided by the builder to take up or remedy this error; the difficulty was overcome, however, and a far superior slide substituted.

Builders of modern high-speeded engines were not long in discovering that this style of bed would not answer for 600 and 800 feet travel per minute, and they have adopted the improved trunk bed-plate, firmly secured to cylinder with the *horizontal* double gibbed cross-head, and the *double* slide bars of steel with horizontal and vertical adjustment, keeping the cross-head pin *always* exactly central with bore of cylinder, thereby preventing the cutting of cylinder and piston-rod, and the heating of any of the wearing surfaces.

Perhaps not the least objectionable feature of the old plan was the expansion of one end of the frame, and of course the slides, by the heat from the cylinder, which at once distorts them, offering great inducements to cut.

The new style of bed and slide obviates all evils mentioned. The English sometimes use the Banjo Frame in double form for propeller steam-bearings.

W. H. HOFFMAN,

Passaic, New Jersey.

Concerning Steam Fire Engines.

BY R. GRIMSHAW.

In most things concerning the steam fire engine, the American maker is far ahead of the European builder. There are reasons for this: the chief being the greater need and use of these appliances, and a greater mechanical and inventive skill. But in all things, the American steam fire engine is not perfect. We regret very much that in such a specialty we were represented at the Paris Exposition of 1878 by only one (and that our latest) builder; and that in the competition trial the engineer of this engine was so unskilled as to let himself be nicely beaten, and have to haul off with his grates burned through and his wheels scorched, as a memorandum of his gross and utter ignorance and unfitness for his position. However, this is a "bye-gone;" the secretary of the building company pluckily came over at once with a good engineer and endeavored to retrieve the defect by a new trial, but, naturally, the French and English builders were not fools enough to give up the vantage they had gained.

But to return to the average steam fire engine that thunders down our streets and upsets things generally. How might it be bettered?

Commencing with the running gear, we find that the "straight-frame" still appears on the catalogues of some builders. Now of what utter use a straight frame is for our slap dash style of running we cannot see. It will not turn a corner quickly, and will not turn at all in some places; and it is harder to work up to a "plug" than any other. The "crane-neck" engine will go almost anywhere without going over on its side, the engineer can get from one side to the other without going all round the machine. Some one will exclaim at once, "How about "horizontal" and rotary engines? Will not they be ruled out by this, in favor of the vertical cylinder machines?" We reply that one of the two makers of rotary steam fire engines now makes crane-necked machines, and the other talks of doing so if he has not already built any; and that there is only one style of horizontal machine now in the market that has not "crane-necks;" and the makers could no doubt turn out "crane-necks" if they were asked for.

As regards the springs—either leaf, gum hiffer, or steel volute will do well if of good material; but the rubber men have got to putting so little India rubber in a so-called "gum" spring that they deserve to lose the trade (as they have almost lost the car spring business; "killing the goose that laid the golden egg").

The wheels are very important factors. They are generally too heavy. A steam fire engine gets all sorts of rough usage, battering, scorching, spoke smashing, &c. If of wood, the hubs should be of metal; preferably bronze; and we should much prefer the "Sarven" and similar patents for inserting the spokes. There are several styles of buggy wheels protected with rubber tires under the metal, rubber cushions at the hubs, &c., and spokes so contrived as to be removable and replaceable at will in a short time. Some of these ought to be used. Wheels with long bronze hubs and metal spokes set staggering are used by some makers; are very strong and stylish; we think that if the spokes were tubes of mild Siemens' steel they would be better.

The "fifth wheel" is usually a very heavy and cumbersome device and requires grease enough to run a cotton factory; and after

all it is not half as light, handy or practical as a centervaine used on one of the French machines — Thirion's, I think — in which there is a simple vertical pivot and then motion in the vertical direction—the fore axle thus having, as it were, three points of motion and enabling the machine to stand squarely and firmly on uneven ground. The axles are rarely stiff enough ; and if the hind axle is "cranked" it is especially apt to spring and throw the machine out of line. The frame had best be made of mild steel, as ought the boiler shell. The boiler ought to hang as low down as possible so as to bring the weight low and lessen likelihood of going over when turning a corner in a hurry. The shell, if of steel, should have the rivet holes *drilled* not punched ; or if punched, punched slightly too small and reamed out to size ; or, better yet, punched exact and the plates then annealed. These points attended to there need be no trouble with cracks starting and spreading with such alarming rapidity as one finds frequently in locomotive practice. We think that the steam fire engine is so important a machine that it deserves a copper fire box, as being a quicker absorber and radiator of heat, and promoting quick and rapid steaming. The water-by space is generally made too narrow, and there are very seldom properly placed hand-holes for removing mud and scale. All boilers should be caulked with a round nosed tool which does not score the sheets and makes the best joints The grate should be of the dump-style, and so constructed as not to warp out of shape and refuse to dump when most needed. We cannot see why copper or brass flues or water tubes should not be used entirely. We like water tubes better than smoke flues alone ; both can be used together. A bright jacket aids in steaming. Manufacturers on this side say that they cannot use an injector to feed the boiler, on account of the steam being so wet.

In Europe they use a common injector. We are in favor of having on every machine three modes of feeding : from the main or fire pump ; from a donkey or spiral feed pump, driven from the main shaft or by a spiral cylinder ; and by an injector, such as the "Hancock Inspirator," as modified for locomotives and having only one lever. The pumps should deliver through a coil heated by the exhaust or otherwise ; and in no case should cold water be fed into the boiler. It is bad enough with a stationary boiler, tending to rack the sheets and to lower steam, but where the feed is so "ticklish" as in a steam fire engine, owing to the small water capacity, it is unpardonable. One make of engine, the quickest at steaming, uses a "coil" boiler and feeds only a small quantity at a time, there being almost no water capacity in the boiler. This gives quick steam and plenty of it, and the boiler is non-explosive, but we were always afraid of an accident to the check valve or some part of the pump, stopping the supply and causing burning of the coil.

The "variable exhaust" nozzle often will not work on account of the lever bending or jamming ; it makes a terrible snorting on a "piston" engine and on the rotaries it fairly *roars*. We would suppress it and heat the feed with the exhaust ; blowing with live steam, or the exhaust might be put into the suction side of the pump. But the principal trouble with the exhaust nozzle is its thinning coals round. This is wasteful of fuel and hence lessens steaming capacity ; and often starts fresh fires on roofs or haystacks. Furthermore it prevents the engineer hearing the word of command or being heard. Besides this, it is not very nice, if unprovided with a helmet, to have a half-ounce coal get down one's neck and burn its way in, as happened to the writer.

The gauges should be in sight and plenty in number ; those with diaphragms are much more likely to spring and become untruthful than those with U tubes, of the Bowden pattern. There should be a loose maximum needle on every one. The safety valves should be large and two in number, as they frequently stick fast ; one should be locked loaded by a weight to a maximum, and the other controlled by a special spring ; and both should be tested on practice days and at the fire. The boiler should be blown off and washed out after each run if possible. Tannate of soda loosens old scale and prevents new. The use of mineral oil lubricants prevents foaming where the exhaust goes into the feed, and it keeps the plates clean. The firing should be thin, even, and often, and the door opened as little as possible to avoid chilling the plates, which would diminish steam and hasten the destruction of the boiler.

We shall not go very deeply into a discussion of rotary *vs. rotatory*, or as commonly called, reciprocating machines. Both can do good work ; there are good and bad engines of both kinds. The rotary throws the steadiest stream and is the easiest to keep in order, but must be kept well oiled or else it gets hot. A steady stream is of great advantage to the pipe-man. The rotary is easier on hose than the reciprocating ; and the vertical machine is easier than the horizontal in this respect. We never could see why Clapp & Jones never built their excellent horizontal machine with the same kind of pumps placed vertically. The vertical machine is easier on packing than the horizontal, and there is no tendency to wearing the cylinder either oval or of varying diameters in different parts of its length ; grit cuts it less. One maker has a good idea of a "variable pump piston," he can diminish the effective area of the piston when a specially high stream is wanted ; but it seems that the same result could be obtained with a smaller nozzle, as engines are run. The pump cylinder should be of brass or bronze, as standing salt water best. The suction valves should have double the area of the discharge, and the suction inlet should be much larger than it is now made. In every case the suction hose should be kept attached "squirrel-tail," so as to be put right on to a hydrant without such backing and filling as is frequently resorted to get just near enough for the couplings to work. On one of the French machines there is a neat little wrinkle in the way of a discharge gate. There are two gates ; and while both of them may be open together, both cannot be closed at the same time ; closing one invariably opens the other.

There should always be a "return valve" between the suction and the discharge side of the pump, so that the engine may be kept going even full speed without the pressure being put on the hose. There should be an "automatic relief valve," so that the pipeman when going up a ladder or whenever he wishes to shut down can shut off the water without bursting the hose ; and so that the hose is likewise safe in case of a kink in it or the fall of a wall on it, &c.

The air chamber should be large, and from time to time air should be let in to make up for that which is absorbed by the water under pressure. This keeps the cushion good. One of the French makers used to have an inflated rubber balloon in there.

The whistle should be loud and clear, and no two engines should have whistles sounding alike.

There are some double machines built with one cylinder and pump placed in line before the other ; this gives the engineer full control of the whole machine without going from side to side, and stiffens the frame, but also tends to rock the engine by careless running over stones, &c.

Self propellers have not yet proved a success where the ground is bad. This proves that we are not yet perfect, for one of the first steam fire engines was a "self propeiler."

We do not see why direct-acting pumps such as the Knowles, Blake, and many other excellent makes, should not be employed for steam fire engines, as the yoke and block are liable to heat and to work loose and require a great deal of attention.

A simpler style of engine still, and one which any village yokel could run, would be a "Pulsometer" and boiler rigged on wheels. It would use up no end of steam, but for all that it would be highly useful for country towns and for factory fire departments.

Wanted—A Trial of Engineers.

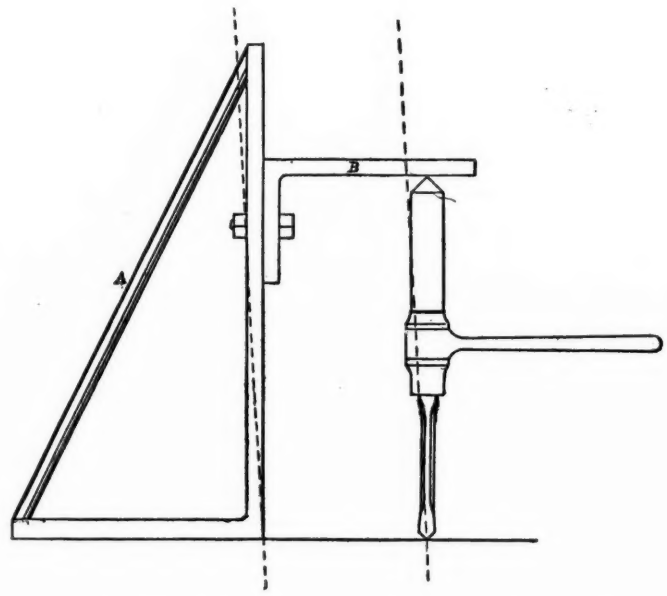
Editor American Machinist :

GENTLEMEN : Some years since at an Industrial Exhibition held in England; one of the novel features was a competitive trial of skill among engine drivers. An engine and boiler was furnished, and a given weight of fuel provided, also a handsome prize for the successful man.

Each engine driver that entered for competition was allowed to manage the engine and boiler as best suited his own sweet will; the result was quite astonishing. If we remember rightly, the successful man showed over forty per cent. more power transmitted to the dynamometer, than was obtained by less skillful management.

This result seems to justify one of your correspondents in the assertion that "the efficiency of any engine department will depend in a great measure upon the skill of the engineer in charge." As most men in charge of engines are ready to back their own ideas of the proper management of an engine, we would most respectfully suggest that it would be a novel and interesting, as well as useful feature, if contests of this nature could be introduced at our annual Industrial Exhibitions. Will the AMERICAN MACHINIST lend its aid in inaugurating a series of contests of this nature?

"CARBON."



Use of the Ratchet Drill.

BY L. F. LYNE, M. E.

There are few branches in mechanics where you will not find room for decided improvement, and the use of the ratchet drill is one of them.

If a person desires to drill a hole with the ratchet, the first step is to find the proper drill, the next is to find a proper means of supporting the drill.

There is in almost every machine shop a device known as an *old man* or knee, which is made for ordinary practice, and constructed like the one shown in the cut without the brace A. Why so little improvement has been made in this direction I am not prepared to say.

The practical working of the support just described is explained in a very few words. When the ratchet is set square, as shown in the cut, and pressure is applied by the means of the screw, the support will be inclined towards the dotted line, thereby causing a proportional deflection of the drill.

It is absolutely impossible to drill a straight hole with this arrangement, by reason of the constant variation in proportion to the pressure ; and for fine work it is impracticable.

The workman in consequence of these variations is very careful not to feed too heavy, hence the origin of the rule with which every machinist is familiar, "The less you turn the feed screw the easier the drill moves."

The plan of adopting a round bar A, which is welded to the ends of the brace, was adopted several years since by the writer, and is used extensively in some shops, its superiority thereby being fully established. A man can, with this device, drill more than double the number of holes that he could with the old design, and rely upon his work being done in a satisfactory manner.

There is just enough spring to this device to allow the drill to work with an even pressure, there being a possibility of getting something too rigid. The bracket B is attached by means of a bolt and also has extra holes for adjustment. There is a row of holes in the bottom part so that it can be placed over the end of a stud or bolt thereby securing it. Believing this to be of general interest where the ratchet is used, has induced the writer to publish it.

I am not aware of any patent existing on this device, therefore the public has a perfect right to use it. The extra work done by one man in a single day will pay for one of these supports.

Another Triumph of American Genius.

We have just received from the American Watch Tool Co., of Waltham, Mass., a small steel tap, the sizes of which are as follows : Diameter, $\frac{1}{100}$ of an inch; number of threads per inch, 375; diameter at bottom of thread, $\frac{54}{10000}$ of an inch. This specimen is a sample of the productions of a new engine lathe, built for screw cutting, and recently completed by the above named company, after much experiment and perseverance. With this lathe it is possible to cut threads of any pitch from 500 per inch downwards, and in diameter from $\frac{1}{100}$ of an inch upwards. It is impossible to see the thread on the specimen sent us, without the aid of a magnifying glass, by means of which it is shown to be as perfect as on screws of a great deal coarser pitch. We are led to exclaim : where is the rule with which to measure American enterprise ? and the echo answers, where ?

Personal.

We regret to learn that Prof. John E. Sweet has given up the position he has so long and so creditably filled as chief of Mechanical Department of Cornell University. Hundreds of the alumni of that institution remember with feelings of gratitude the practical mechanical instruction they received under Prof. Sweet's guidance by the aid of which many of them now fill high and responsible positions in the field of mechanical engineering. The university has lost one of its best and most valuable instructors, whose place it will be exceedingly difficult for another to fill. Prof. Sweet has removed to Syracuse, and we presume will remain in his chosen vocation. Readers of the AMERICAN MACHINIST will hear from him from time to time through these columns.

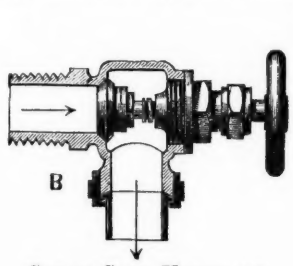
The Holly Manufacturing Company has recently taken a number of contracts for water works, and their works at Lockport, N. Y., are run at their full capacity.

The Universal Injector.

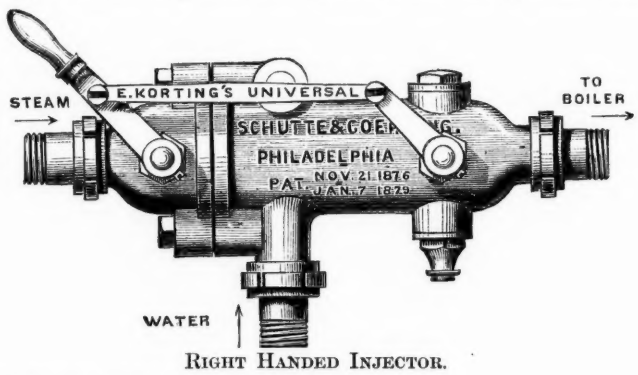
We exhibit on this page some views of the Korting Patent Universal Injector, manufactured by Schutte & Goehring, Philadelphia, which has gained considerable celebrity both in this country and Europe. It is named Universal because, according to the maker's claim, it works to the same advantage and fulfills the same duty under all circumstances, with high or low pressure steam, hot or cold water, water under pressure or suction.

As will be observed, the instrument is a combination of two steam jet devices; the first one proportioned for lifting and delivering the water under some pressure into the second one, where its velocity is sufficiently augmented to overcome the counter pressure of the boiler. The explanation of the proper working of the Injector, at the lowest as well as the highest steam pressures, without any adjustment of parts, is found in the fact, that the quantity of the water taken in by the first device and delivered to the second one, is directly in proportion to the pressure of the steam, so that the first one acts as a governor for the second one.

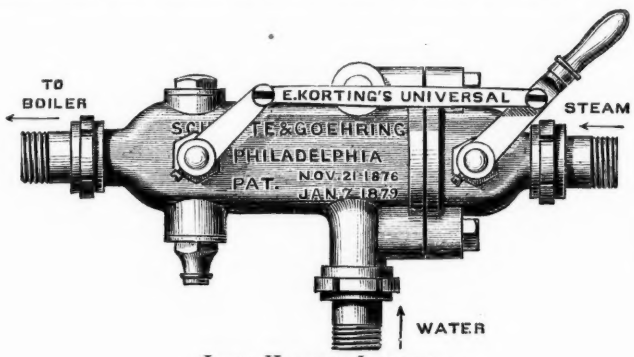
The explanation of the feeding of hot as well as cold water, is found in the construction and proportion of the first apparatus, which has a proportionately small steam nozzle to insure high suction, and as the water is delivered to the second one under pressure, its temperature can be corresponding to this pressure, and may be delivered into the boiler above the boiling point. At the same time the combined area of the two steam nozzles are smaller than that of any other Injector of the same capacity, hence its duty must necessarily be higher.



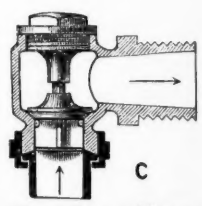
STEAM STOP VALVE ON BOILER.



RIGHT HANDED INJECTOR.



LEFT HANDED INJECTOR.

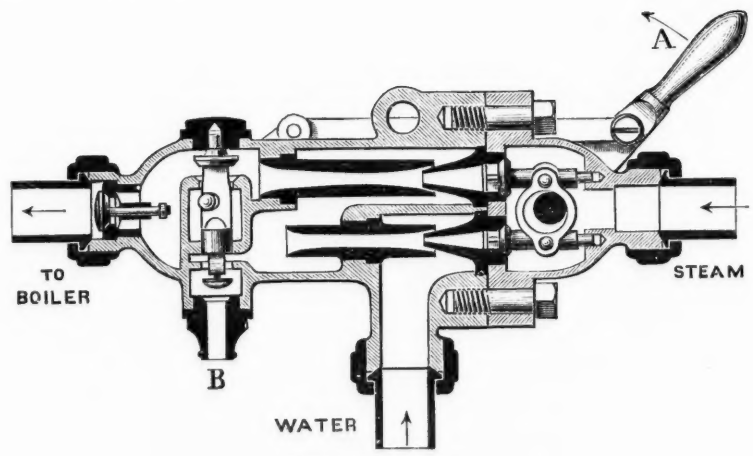


MAIN CHECK VALVE ON BOILER.

This combination of the two devices, and its self-governing qualities without moving parts, makes the apparatus, it is claimed, the least sensitive—a great desideratum on locomotives.

The limits of admissible temperature are: Feedwater 150 deg. Fah. delivered into the boiler, with 150 lbs. steam at 250 deg. Fah.

The cuts show a right handed and a left handed injector, also a sectional view, the main check valve and the steam stop valve on boiler. The manufacturers of this injector are represented in New York by Thos. Prosser & Son, 15 Gold St., who will furnish any further information desired.



SECTIONAL VIEW

Extracts from Chordal's Letters.

Mr. Editor:

* * * It is my experience with machinists that they are always hungry after something to read if it refers to their immediate vocation, and brings knowledge not included in skill. A workman will often resent a thing which looks like instruction in something he thinks he knows all about, but will grasp with avidity at information regarding the material he works with, or the tools he uses. Of course, such reading is mostly done, and mostly appreciated by the young chappies who are priming for the future. If owners of shops will keep one eye open for such tendencies they will find it an excellent index to character, and a pointer towards an excellent plan of encouragement which will repay ten-fold.

The Nicholson File Co., of Providence, sent me a copy of their Treatise on Files, lately, the same book you have published some extracts from. Now this splendid little book would find more appreciation in the shop than would a new translation of the Illiad among the blues. Why under heaven didn't these folks get up this book when I was ruining files for a living. If I could take this book with me and go back over the ground of my shop life and become owner of what I could save, or make by the instruction imparted by it, I would feel able to, and justified in putting a copy of this book into the hands of ten thousand file-users who never buy files. It seems to me the Nicholson File Company would be doing a stroke of business if they could scheme out some plan by which shop-owners could be induced to distribute some of these books among the men. I don't mean a rough, cheap edition, but the elegant cloth-bound copies now sent out.

* * * Emery wheels do not get justice in the shop. The common plan is to rig up some outlandish kitchen-table affair with an illy-proportioned arbor, and to put an emery wheel on it and say the shop is fixed for grinding. The whole arrangement is put off in some place where castings get piled in front of it, and where no man is going to climb to, if he can help it. Keeping the thing in order is nobody's business, and soon the affair falls into disrepute. So does any other machine treated in the same way. Let a planer be a public tool and soon it will be a wretched tool, and be shunned as the emery wheels are. But the worst is not told. The truth is, nobody in the shop knows how to get good results out of the thing, and it is looked upon as simply one kind of a grindstone, which don't throw mud and water, and is nice to touch a piece of iron on once in a while. There is no little arrangement in the shop which will so well repay investment, and which will so well justify care in selecting both the machine and its operator.

There are a thousand-and-one little things turning up every day which a keen-eyed foreman will see are fit subjects for emery wheel operations. I don't mean in a manufacturing business, but in a simon-pure machine shop, where you don't know what's coming next. Vise work can often be surfaced all over to remove scale. Often it can be surfaced and polished and the vise work left off. Often it can follow vise work, and do the polishing, and often it can be used simply to remove metal and change the shape or dimensions of a piece. All of these things, it will be seen, are common operations performed in a manner not usual in the shop. But one thing must be remembered. A machinist cannot do this work on emery wheels. That is, he cannot take a job from his vise and finish it on an emery wheel. Why? First, because, as before mentioned, the emery rig being everybody's care is nobody's care and aint in order, and, second, the machinist never gets the swing of emery wheels. He will file up a hex nut all right, but will ruin it on an emery wheel. He can chip scale off of work and file it afterwards, but if he tries to scale it on a wheel he gets it hot, burns his fingers, ruins a wheel, and glazes his work so a file won't touch it.

As far as shaping a piece of curved work on an emery wheel is concerned, he might as well try to fly. He will put a thousand cat faces on it and take away all the delicacy of shape the thing ever had. He tries to shape up a cutting tool; he turns it blue and wears it out in filaments which, when removed by some other process, show that the apparent form was decidedly deceptive. Don't try to mix machinists and emery wheels; they will ruin and corrupt each other. But they can get along splendidly if they are not mixed. Step into a hardware factory. Notice a man finishing a common carpenter's brace. Take one of the rough braces home and set your best vise-man to finishing it. Note the time, and the shape he leaves, and the thing he calls polish.

The man we are watching has a couple of be ltsand a couple of wheels, may be a hundred and fifty dollars' worth of tools altogether. With these and his skill he works on any shape you bring him. If a drop-forging, like the braces, he roughs and finishes and polishes and loses no little detail of the original nicely rounded and purely outlined form. If he finds a bad spot, he goes deeper, but blends the flat till it is invisible. His polish is real polish, whatever may be said against it, and is the same all over, while a vise-man's polish is O. K. where it is easy to get at it and do it, but slouchy where the kinks are. The emery-wheel man can't file a finish on a job. Why? Because he don't know how; he never learned; got a trade of his own. Same with the vise-man. What does this lead to? This: Look around the shop and see how much of your work is similar in shape to what you see in the market, but far inferior in character of surface and superior in cost, and ask yourself if there ain't some art which is not represented in the shop and which should be represented. If you find considerable such work, and if you have thirty hands in the shop, you certainly will send to some good emery-wheel concern and either buy from them or get drawings for the proper rigs adapted to your work. Let them send you a man at ten-per cent. less wages than you pay the general run of lathesmen. This man will tell you more about the wheels and belts you want than your judgment could tell in a year. Set him to work the same as you would a lathesman and in a short time you will find that you pile an immense quantity of work around him which you wonder how you ever got done before. Watch the man. First, there is his skill, about which nothing can be said, except that it is skill. He knows how. But you can see that he keeps a different sort of an establishment from the old one. The wheels are always in good face, and they run true, and the arbors are heavy, and stiff, and steady, and the speeds are right, and a wheel is always ready for business. You know very well that bad as the old rig was its very viciousness was often inaccessible because the belt was on a strike, or off the pulley because the oiler didn't see fit to keep the counter-shaft oiled.

* * * Honestly and truly do you have an oiler? I don't mean a special dignitary with a sinecure, *vulgo*, soft thing, but some man, high or low in position, who is responsible for every squeak six feet from the floor? If you have such a functionary, does he oil countershafts, etc., over machines having a tender? Some shops give a certain laborer the oiling job, but expect counter-shafts to be oiled by the man who runs the machine below them. This is a bad plan. It's a nasty job that a lathesman don't like, so he puts it off as long as things will run. When he does it he must skirmish around for ladders and things, and all the time a valuable man and machine are idle. Then there are always a lot of machines around a shop which are not run regularly by one man; such countershafts never do get oiled if you depend on the machinists. Same with upright drills. They are run by everybody, and it is a notorious fact that everybody won't oil anything he can't reach. If he finds something high up on a drill-press stuck for lack of oil, he jumps the job if he can, and waits for somebody else to fix things up.

It is a much better plan to make Charlie oil up every thing in the shop which is higher than his ear. Attempts have been made to make machinery self-oiling by the use of self-feeding devices, of which more anon.

Very respectfully,
CHORDAL.

The New York office of the Danforth Locomotive and Machine Co. (of Paterson, N. J.) has been removed to No. 115 Broadway, Room 79. Mr. H. A. Allen remains agent.

Messrs. Post & Co., extensive dealers in machinists, railway and telegraph supplies in Cincinnati, were burned out on the morning of the 5th of June. Their loss was estimated at $45,000, which was nearly covered by insurance.

As already referred to, says the *Montreal Journal of Commerce*, a woolen factory is to be established at Napanee under the stimulus of a grant of $4,000, the proprietors agreeing to carry on the business for eight years, employ not fewer than twenty-five hands daily, and expend $10,000 annually in wages. The factory is expected to be in complete running order early this fall.

Clark, Reeves & Co, says the Philadelphia *Trade Journal*, through their Cuban agent, Mr. Thomas L. Ricart, of 21½ Walnut street, have shipped to Havana, on board of the schooner Etta A. Stimpson, one iron through bridge, 198½ feet span, for the Oeste Railroad. It will be known as the San Diego River bridge, and will be the longest bridge in Cuba. We have noticed with pleasure that Mr. Ricart's success in the West Indies and South America for supplying railroad companies with all kinds of material has been very marked in the last few years. Philadelphia manufacturing has been favored in the last year by Mr. R., with orders for six iron bridges, one iron steamer, one wooden steamer, and many other orders for export. This gentleman is to be congratulated upon his well-deserved success.

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EDITORIAL ANNOUNCEMENT.

☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

NEW YORK, JULY 12, 1879.

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Commercial travelers for machinists' and engineers' supplies are cordially invited to call upon us at 96 Fulton St., (corner of William) whenever they are in town.

Our Third Weekly Issue.

Compliments are coming in from all quarters, in view of the enlargement of our field involved in our recent change to a weekly, and we are gratified that it should be so.

Not only our newspaper friends, but our readers, are daily manifesting the kindly opinions which they hold touching the character and prospects of this journal.

The high purpose and unsubsidized position of the AMERICAN MACHINIST find an equal place in the good opinions of these, our friends, with "the strong, original merits of its reading columns," if we may be pardoned the flattering quotation.

Already, too, the change, by keeping the paper more regularly upon the news-stands than the best monthly could possibly hope to be kept, is adding alike to our audience and our influence.

As a result of our arrangements for foreign circulation, the AMERICAN MACHINIST

"Has donned its pilgrim staff and shoon,"

and is becoming a welcome visitor in machinery and engineering circles in Great Britain, and indeed, wherever the English tongue is spoken.

The Infamous Prison Contract System.

During the last sessions of several State legislatures, notably those of New York, Connecticut, New Jersey and West Virginia, the unjust contract system, as practised in our prisons and penitentiaries, came up for consideration. Although in no instance did it result in the abolition of the system, the friends of legitimate competition in productive industries have cause for gratulation on the progress achieved. In the New York State Assembly, May 21, the bill excluding certain manufactures from the prisons was lost by only 68 noes to 39 ayes. Several legislative committees have been appointed to examine into the effects of the penal contract system and report at the next session. If these committees do their work faithfully, without fear or favor, we may expect the public to become more enlightened upon the injustice constantly done to some of our private manufacturing industries, by the opposition of a government institution.

The average price paid per day for convict labor is as follows: In Iowa, 43 cents; New York, 34; Indiana, 45; Nebraska, 35 to 40; Kansas, 45; Michigan, 40; Maryland, 40; Illinois, 40; West Virginia, 25; Missouri, 40; Vermont, 35; Rhode Island, 40; Connecticut, 40; Ohio, 45¼; Pennsylvania, 40; Minnesota, 40; California, 55 and 50. A certain class of political economists will argue that prison labor is not worth as much per man as free labor. When the work requires skill and careful attention on the part of the operative, this is usually the case, but when the guiding intelligence belongs more to the machine than to the man who attends it, a prisoner will do as much work, under the watchful eye of a keeper, as a regular mechanic employed in a private manufacturing establishment. It is well known that the best mechanical genius has been employed to provide automatic machinery for prison workshops. Who doubts that a convict can feed a shoe-pegging machine as well as a free man? Turn prisons and penitentiaries into shoe factories, chain works, stove and hollow ware foundries, axle factories, saddlery factories, hat factories, hardware and other factories, with tens of thousands of able-bodied men constantly employed at twenty-five to forty cents a day, and soon the honest, intelligent and industrious mechanics in these employments will be reduced to the extremes of poverty and want. It is upon the man who works for his daily bread, and who has perhaps a wife and children to support, that this burden falls most severely. The men who own and conduct our manufacturing establishments will not pay $1.50, or $1.00, or even 50 cents a day for labor if they can obtain what they require for 40 cents. If, on account of prison competition, these shop owners cannot sell their wares for prices which will enable them to pay men living wages, the remedy will be to reduce wages to what they can afford to pay or shut up the shop. No matter which course is followed the working mechanic is bound to be the sufferer as long as the odious convict-labor system is sustained by the States. Prisoners never go on a strike, on a picnic or a spree, nor are there any "journeymen" among them. Contractors, therefore, have quite a reliable force. It may be asked by some, why, if prison labor is so desirable, are not higher prices offered by competitors in securing the contracts? We answer that prison contracts are but a tail to the great political kite that mechanics are called upon to shout for (but not to handle) before every election, and which is relied upon for a portion of the means to run the political machine. A great deal of glorification of the contract system has been indulged in by a portion of the press, over the fact that Sing Sing prison has become self-supporting, and a few thousand dollars annually saved to the tax-payers of this great State. Against this, take one item from that hive of opposition to honest labor. Nine hundred convicts are there daily employed in making stoves and hollow-ware. Is it worth while to oppress this industry in order to reduce by a few cents each wealthy tax payer's bill?

Every dollar saved in this way reduces the comforts and conveniencies of scores of honest toilers whose means, at best, are none too ample.

In some localities, mechanics have been aroused to hold meetings and petition lawmakers to put a stop to this grinding down of honest labor to a level with the forced work of felons. We hope to see all classes of artisans, whether each particular trade feels the burden of prison competition or not, join together in demanding the abolition, root and branch, of the infamous and growing evil of State opposition to private industry.

The Explosion Epidemic.

A recent issue of a morning paper contained details of three boiler explosions, all of which occurred the day previous, and each of which was attended with fatal results. One of these calamities caused directly the loss of five lives, a number of persons additional being injured more or less severely.

By the second explosion two lives were lost, six other persons being injured, with every probability that some of these injuries would prove fatal.

By the third explosion four lives were lost. To the account of the casualty was appended the statement that the steam gauge only indicated 140 lbs. of steam, while the ordinary pressure was understood to be 150 lbs!

When full statistics of all the horrible steam calamities endured by humanity in this country during a single year are collected together, the sum total forms a startling commentary upon the boasted mechanical advancement of our age.

Here are innocent persons of both sexes and all ages, happy and unthinking, being daily flung into eternity by this brick-and-mortared monster, and beyond a few brief lines in the daily papers, announcing the respective casualties, nothing is said, nothing is done!

Makers go on producing unsafe steam machinery, because they know that they can sell it; many buyers go on pulling all the strings of competition in order to reduce prices, too often below living rates, until, finally, the purchase being made, they complete the nefarious record by putting a careless and incompetent, because a cheap man in charge, and presently comes the natural result, in the shape of a casualty and three lines in the morning papers.

Now, following out the thought, "What is to be done?" We feel assured of one thing, after all, the main fault is with that patient creature, the public, exemplified in the person of the buyer and owner of this death-dealing monster.

In the first place, let him be willing to pay the price of a good engine and boiler, taking care to buy of a maker who has some character to lose.

In the next place, let him inform himself sufficiently of the nature and practices of this dumb but mighty force, which he intends thus to harness up for his own purposes, to guide him in the selection of an attendant upon its really sure, but seemingly capricious motions.

Above all, let him be willing to pay enough to secure the services of a pains-taking, sober, thinking, reading man, who has studied his subject, and feels himself not the servant merely, but the master of the grim avenger under his charge. No surer preparation for a boiler explosion could be named, than putting an ignorant, beer-sodden, careless "engineer," too poorly paid to study, and too lazy to think, in a position enabling him to sleepily nod away the days in charge of even the best engine.

Let it be remembered that steam engineering is a science which a man must know before he is fit for its duties. It is also an economic and a progressive science. To be fit for its duties a man must study. The nature and properties of steam, and their results as exemplified in mechanism and motion, are subjects which must be familiar to the steam engineer, and no man who is not acquainted with them, or who is too careless to learn and to apply them, is fit to be trusted in an engine room.

Witness the instances occurring daily, in which the upper portion of a boiler, for example, where there is no water, is allowed to become unduly heated through the use of boards or shavings as fuel, until the steam, thus super-heated, finds the necessary vent by blowing the whole establishment into fragments small enough, almost, to be picked up with broom and dust pan.

Clearly, there is here a fertile field for improvement. And may the time soon come when engine makers, engine buyers and engineers will all alike unite to render these too frequent catastrophes impossible.

It is true that some societies have been formed, and some engineers have done what they can to correct this crying evil, but, as yet, nothing like the beginning of an organized movement has been made.

In view of these facts, let the thinking, reading men, especially, among the engineers, do their part to arouse that degree of public sentiment, which never fails, eventually, to respond to any real reform, and these distressing records, that daily divide our attention with the Zulu war and the Egyptian question, will begin to show some abatement.

Too Much Legislation.

Politics, as such, do not lie within the field which this journal has chosen to occupy, but there are occasions when even a mechanical newspaper may have views which are not to be wholly suppressed.

This time, the recent adjournment of the National Legislature furnishes us alike with our excuse and our topic.

We have in this country altogether too much legislation. The main reason for this is that our legislative bodies, both State and National, have reserved to themselves functions, which, properly restricted, should be delegated elsewhere.

Thirty-eight costly State Assemblies sit in marble halls for months, debating such momentous questions, as, for example, the matter of authorizing a certain road to be opened in such a township of such a county, or of granting the necessary permission to John Grubb to change his name to the more elegant and euphonious title of Augustus Fitz-Herbert. All of which leaves wholly out of the account the fact, that the county in which Mr. Grubb lives, and moves, and is most likely to owe money, is, or ought to be, much better prepared, through its authorized officers (be they supervisors, commissioners, or what not) to decide the matter upon its merits, than any legislative body whatsoever, sitting at a distance, could possibly hope to be.

Then, too, the National Legislature spends months in auditing and arranging private or routine bills, concerning matters which, under suitable limitations, should be referred to the departments, or the courts. As a re-

sult, the vital matters which really concern the national welfare, and which are alone worthy the attention of a body so august, are pushed through in incomplete, or improper shape, to the detriment of just and true national interests.

These things operate to keep Congress perpetually sitting, and to allow the ambitious demagogues among its members innumerable, indeed, continual, opportunities to work harm to the business interests of the country by the threat of perpetual change.

How much better we should all feel, if our laws, as they are finally passed, could only be made unrepealable for a term of years! Good laws would then stand a better chance of working out good results, while bad laws —well, we should have fewer of them.

Concerning the series of biographical sketches of eminent mechanical engineers begun in our first weekly issue of June 28, we fancy no one could be more surprised on seeing himself in print than the subject of the article and illustration, Mr. William Sellers, the whole matter having been prepared, not only without his consent, but without his knowledge.

The photograph from which our engraving was taken was obtained from the photographers at Wilmington, Del., and thanks to the deft skill of Mr. Bross, has made a picture greatly superior to the average of newspaper portraits. We imagine that, among eminent mechanical engineers, there is not one, who, if his opinion had been asked, would not have said, that, in such a series, Mr. Sellers was entitled to the initial place which we have given him.

In the present number, the distinguished engine builder, William Wright, of Newburgh, appears as No. II of the series.

The Tap and Die Industry.

The manufacture of machinists' taps and dies as a distinct branch of industry is of comparatively recent date, the first establishment to engage in it by means of special automatic machinery being the New York Tap and Die Co., in 1866, though for many years previous to that date "stocks and dies" had been made in quantities for blacksmiths' use. Up to 1866 all large machine shops in this country made their own taps, and, although at a much greater expense than it would require to buy them (of superior make) a considerable number of shops still make their own. Whether this course is caused by reluctance to depart from a time-honored custom, or by settled plans to utilize the labor of workmen who would otherwise be idle, we will not assume to decide. In making taps "for home use" the blank is first turned upon a lathe to the right length of shank and desired taper; next threaded in the lathe, then placed in a milling machine, and the four slots cut, and finally the tap is "relieved" by a file in the hands of the workman. To make a ⅝-inch tap by this method takes a good workman all day, to which add the cost of stock and forging, then compare with the selling price of taps of this size, and the account will show a wide margin in favor of the latter.

The best workman cannot make two taps exactly alike in the relief by hand filing. If there be too much relief the cuttings will get between the thread and the metal around the hole in backing out the tap, which will in a little while ream off the thread and spoil the tap. On the other hand, too little relief will cause the tap to work hard. It is only by the use of special machinery that taps can be made exactly uniform. One obstacle which tap and die-makers have to contend against is the multiplicity of differently proportioned threads in use. Some shops seem to adopt odd threads so that machinery of their manufacture will come back to them when repairs are needed. The sharp V thread is used in most shops, though the U. S. Standard thread is making considerable progress towards general adoption. The Master Car-Builders Association, at their late meeting, passed strong resolutions in favor of that thread. If the work of all large shops is to be made interchangeable, which is very much to be desired, the U. S. Standard screw thread must be the one universally adopted. The perfection attained in manufacturing taps and dies by special machinery, is one of the important triumphs of American mechanical genius. To make all sizes fit accurately to gauge by the old method is an impossibility. Another triumph of American skill is found in the fact that the best manufacturers of taps and dies have, after full experience, demonstrated that American steel is superior to the best foreign for this purpose. Two years ago very few taps of American steel were sold; now, a very large part of those made are of domestic material.

We append a list of those making a specialty of tap and die manufacturing. The two latter designate their product as "stocks and dies."

THE PRATT & WHITNEY CO., Hartford, Conn.
MORSE TWIST DRILL & MACHINE CO., New Bedford, Mass.
H. PRENTISS & CO., Essex, Conn.
J. M. CARPENTER, Pawtucket, R. I.
ROCHESTER MACHINE SCREW CO., Rochester, N. Y.
NEWTON & COX, Cleveland, Ohio.
THE WILEY & RUSSELL M'F'G CO., Greenfield, Mass.
J. M. KING & CO., Waterford, N. Y.
HOLROYD & CO., " "

Reception of Our Weekly.

We have received many favorable notices from our friends of the press upon our change to a weekly, for which courtesies we will always feel grateful. We have space this week for but a few of them.

(*From the American Journal of Industry.*)

Following the example set by this paper, the AMERICAN MACHINIST has changed its time of issue, and will hereafter appear weekly. We are glad to note this sign of prosperity with our valued contemporary. Its monthly visits were always a source of pleasure and profit, and we consider the increase in their frequency with much complaisance.

(*From the Boston Commercial Bulletin.*)

The AMERICAN MACHINIST, a monthly journal, devoted, as its name implies, to the mechanic arts, starts in as a weekly journal with the issue of this date. The MACHINIST is a handsomely printed paper, with varied mechanical information, papers on special subjects by experts, correspondence, etc. It is published in New York by the American Machinist Publishing Co. at $3 a year, and sold for six cents a single copy.

(*From the Altoona (Pa.) Morning Tribune.*)

The AMERICAN MACHINIST has changed from a monthly to a weekly publication. It is handsomely printed, elegantly illustrated, abounding in useful and instructive matter. Every machinist should get a copy of it. Terms, $3 per annum. Address, American Machinist Publishing Co., New York.

(*From the Jersey City Argus.*)

The AMERICAN MACHINIST, a New York journal, devoted to the interests of machinists, engineers, founders, boiler makers, pattern makers, and blacksmiths, has met with so much success as a monthly that announcement is made in the current number that it will hereafter be a weekly publication.

(*From the Norristown Herald.*)

The AMERICAN MACHINIST, a New York monthly, will hereafter appear weekly. The MACHINIST is a handsome sixteen-page journal, containing valuable mechanical information, reviews of new machinery, correspondence, etc., and appropriately illustrated. Terms, $3 a year.

(*From the Philadelphia Day.*)

The AMERICAN MACHINIST, an able paper, published in the interest of machinists, engineers, founders, boiler and pattern makers, and blacksmiths, has changed from a monthly to a weekly. The AMERICAN MACHINIST is published by a publishing company at No. 96 Fulton street, New York.

(*From Every Evening and Commercial, Wilmington, Del.*)

The AMERICAN MACHINIST, a sixteen-page periodical, published in New York, in the interests of American artisans, has been changed from a monthly to a weekly. The publishers in the first number of the new issue, a copy of which they send us, announce that they propose to make the MACHINIST the standard machinery newspaper of America, and judging by the contents of the copy before us this promise does not appear at all to be an extravagant one. The MACHINIST is well edited and well printed, and one excellent feature of the paper, which will commend it to every intelligent mechanic, is the fact that its reading matter and editorial comments are entirely free from the suspicion of being puffs. This is attested by the articles themselves as well as by the declaration of the gentlemen who conduct the paper.

(*From the Passaic City Daily News.*)

The AMERICAN MACHINIST, a journal for machinists, engineers, founders, boiler makers, and blacksmiths, No. 8 and Vol. II, is before us. With this issue it changes from a monthly to a weekly. It is neatly printed, and clear, concise and able in its descriptions of mechanical ingenuity. It contains many interesting features which our space will not admit of mentioning. Sold at the moderate sum of $3 per annum.

In the present number we notice a communication from our townsman, W. H. Hoffman.

(*From the Wilmington Post, Wilmington, N. C.*)

AMERICAN MACHINIST.—A journal for machinists, engineers and other mechanics, is published now weekly by the American Machinst Publishing Company at 96 Fulton St., New York City, at the very low price of $3.00 per annum. It is a very handsome and interesting sixteen-page journal that every mechanic should have.

(*From the Newark (N. J.) Daily Journal.*)

The AMERICAN MACHINIST.—This valuable periodical has met with such marked success that its publishers now commence to publish it weekly instead of monthly. The number for June 28th, under the head of "Our American Mechanical Engineers," contains a portrait and biographical sketch of William Sellers, of Philadelphia. The number has several illustrations of different kinds of engines, and is crammed with information of interest to mechanics. It is published in New York at $3.00 per year, at 96 Fulton Street.

Curiously enough a yearly subscription came to the AMERICAN MACHINIST recently from a prisoner confined in one of the Western Penitentiaries. While we hope that our connection with our new subscriber may be of long duration, we trust that we shall soon be able to change the address, with the knowledge that the paper has done something to give him a new and better start in life.

Business Specials.

Thirty cents a line for each insertion under this head.

Those wishing special tools designed and built should write to W. H. Warren, 25 Hermon Street, Worcester, Mass.

The Huntoon Steam Governor Co., of Lawrence, Mass., warrant a direct saving in steam of from 10 to 20 per cent. over any other Governor known; while for quick and accurate regulation, great durability and lasting economy in use, they guarantee results never before attained by any other. See advertisement.

Brown & Sharpe M'f'g Co., Providence, R. I., keep in stock at reduced prices Patent Cutters for the teeth of gears which can be sharpened by grinding without changing their form. All wheels of same pitch cut with them will run together correctly. Send for new catalogue.

National Steam Pump, simple, reliable and durable. Send for illustrated catalogue with reduced price list. W. E. Kelly, New Brunswick, N. J.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) A. H. G., St. Louis, writes: Please answer these questions through the proper column. The water in my glass tube water gauge varies from one-and-a-half to two inches, when steam is up and engines working. In the morning when I come to raise steam, and the steam gauge shows no steam, the water goes up and down in the glass tube just the same. The pipes, top and bottom of the gauge, are both the same size, (¾ inch pipe). By looking closely at the gauge I noticed drops of water falling down the tube. From boiler to water gauge is 20 feet. Could the condensation in the steam pipe, to top of water gauge, cause the variation? By answering the above you will oblige a subscriber. A. It is hardly possible to give you a positive and direct answer for the reason that you do not state anything about the construction of your boiler. But taking your simple statement, we would say that the movement of the water in the glass gauge is owing to the ebullition of the water in the boiler, and the different stages of heating through which it has to pass in raising steam, and would cause it to be demonstrated in the glass. We remember a case where steam was being raised on a boiler, and just before the water began to boil we noticed a violent agitation in the glass, there was a sudden report as if a rifle had been discharged and the boiler was shaken on its foundation. There is a point where just as the water begins to boil a sudden change takes place inside the boiler and the violence of this change depends upon how much the temperature of the water has been raised above the boiling point, or 212 degrees. The safety valve should always be raised during the process of raising steam on a boiler, so as to allow the air to escape and also to prevent the accumulation of gases before steam has begun to form. In the experiments of Donney and Magnus it was found where there was a partial vacuum in the boiler, the temperature ran up to about 400 degrees before it began to boil, and when ebullition did take place it caused a violent explosion. An instance of the kind is on record where a violent boiler explosion took place before the steam gauge indicated a pound of pressure, and before the water had begun to boil.

Your pipes are rather too long, and great care should be observed to keep them free from dirt, and the glass gauge should be as near the boiler as possible. The ends of the pipes connecting with the boiler should be the lowest, so that all the condensation from the pipes should run back into it, and not drop down the glass. This alone could not cause the agitation that you speak of.

(2) J. B. M., Atlanta, Ga., writes: Can you give me a little instruction in reference to the calculations for the construction of a ball-governor for steam engines? I desire something plain. A. The height of the cone in which the arms revolve measuring from the plane of revolution to the center of suspension, will be the same as that of a pendulum which makes the same number of beats per minute that the governor makes of revolutions, or if the number of revolutions per minute be fixed, and we wish to obtain the proper height of cone, we divide the constant number, 375.36, by twice the number of revolutions, which gives the square root of the height of cone, and consequently the height itself is equal to the square of this number. These relations are exhibited in the following rules:

To determine the speed at which a governor must be driven when the height of the cone is fixed in which the arms revolve:

Rule. Divide the constant number 375.36 by twice the square root of the height of the cone in inches. The quotient is the proper number of revolutions per minute.

Example. A governor with arms 30½ inches long, measuring from the center of suspension to the center of the ball, revolves in the mean position of the arms at an angle of about 30 degrees, with the vertical spindle forming a cone of about 26½ inches high. At what number of revolutions per minute should this governor be driven? Here the height of the cone being 26.5 inches, the square root of which is 5.14 and twice the square root 10.28, we divide 375.36 by 10.28, which gives us 36.5 as the proper number of revolutions at which the governor should be driven.

(3) C. F. L., Baltimore, Ind., writes: I have some water pipes about my premises which are made of galvanized iron, and I have heard that such pipes will poison the water so as to make it unfit for drinking purposes. What is your opinion on this subject? By answering this you will greatly oblige. A. It is said that water kept in zinc tanks, or flowing through iron tubes, galvanized inside, rapidly becomes poisoned by soluble salts of zinc formed thereby, and it is recommended to coat zinc surfaces with asphalt varnish to prevent this. Yet in the city of Hartford, Conn., service pipes of iron galvanized inside and out, were adopted in 1855 at the recommendation of the Water Commissioners, and have been in use ever since. They are likewise used in Philadelphia and other cities to a considerable extent. The action of lead upon some waters (even pure ones) is highly poisonous. The subject however is a complicated one. An injurious ingredient may be attended by another which neutralizes its action. Organic matter, whether vegetable or animal, is injurious. Carbonic acid when not in excess is harmless. The safest way, and the course which we would advise, is to allow the water to run before using long enough to thoroughly empty the pipes of the water which has remained in them during the night.

(4) G. E. D., Burlington, Vt., asks: Which is the most destructive to iron—to place it in sea water where it will be entirely covered all the time, or where it will be uncovered at low water and allowed to dry? A. The most prejudicial exposure for either iron or wood, is that to alternate wet and dry. At some dangerous spots in Long Island Sound it has been the practice to drive round bars of rolled iron about four inches diameter for supporting signals. These wear away most rapidly between high and low water, at the rate of about an inch in depth in 20 years, in which time the 4 inch bar becomes reduced to a 2 inch one, along that portion of it. Under fresh water especially, or underground, a thin coating of tar applied by heating the iron and applying the tar hot will protect iron, such as water pipes, etc., for a long time. The sulphuric contained in the water from coal mines corrodes iron pipes very rapidly.

(5) G. A., Port Deposit, Md., writes: We have an argument here and come to you for your opinion. First: We have a steam boiler (Locomotive type) which when cold will not show water at either gauge until either whistle or throttle is opened. Please tell us the cause. Second: We also have a horizontal engine, the argument about it is in regard to motion, whether forward, backward, right, etc. It runs as per diagram. Note. (The diagram sent us represents, supposing the person viewing it to stand facing the engine on the side opposite the fly-wheel,) the cylinder placed on the end to the right, and the top of the fly-wheel turning towards the cylinder. Please give us some information in regard to the above and oblige. A. First. Water at a temperature of 40 degrees is equivalent to unity, or in other words will expand if the temperature is raised or lowered. When the temperature is raised to the boiling point = 212 degrees, the expansion = 1.0402. When the throttle is opened, the steam naturally rushes towards the opening, and the pressure upon the surface of the water being relieved, it is inclined to follow the course of the steam, consequently the water is raised in the boiler, in proportion to the area of the orifice made by opening the throttle. The locomotive boiler in particular is inclined to raise the water, or prime, more than boilers of other designs, because of the larger amount of heating surface. For other information in reference to action of water in boilers, see Questions and Answers in this issue. Second: A right hand engine to run right handed, is one that has the cylinder on the end of the bed plate towards the left hand, supposing that you face the bed plate standing on the side opposite the fly-wheel. The top of the fly-wheel must turn from the cylinder. A left hand engine being necessarily the reverse. In the diagram that you represent you have the cylinder on the end of the bed plate towards the right hand, which constitutes a left hand engine. But the top of the fly-wheel turns towards the cylinder, and the result is that you have a right hand motion of the wheel, or the same motion that you obtain on a right hand engine, your engine of course running backwards. A right hand motion is the same as is used in tightening a screw with a right hand thread. It is sometimes termed in practice, "running with the sun, or as in the case of a screw with a left hand thread," against the sun.

LITERARY NOTES.

THE TWENTIETH ANNUAL REPORT OF THE TRUSTEES OF COOPER UNOIN FOR THE ADVANCEMENT OF SCIENCE AND ART.—May 29, 1879. Peter Cooper, Pres., J. C. Zachos, Curator.

The Cooper Union is an Institution of which every New Yorker should be proud. Founded by the munificence of the great philanthrophist, Peter Cooper, it has been the means of furnishing to over three thousand of the youth of both sexes a practical education free. Its evening schools are always full, and give the best advantages to those who cannot devote the day time to acquiring a practical knowledge in Science and Art. The free reading room (well supplied with books and periodicals) and free lectures are largely attended. Both apprentices and skilled mechanics find at Cooper Institute the means of elevating themselves, and gaining valuable information that will help them to take advanced positions in their respective callings.

New York mechanics find that evenings spent there represent time well employed, and that it does not require many months to show the wisdom of their choice as compared with that of many fellow workmen who pass their evenings at the lager beer saloon. The admissions to the evening schools of Science and Art have amounted to 2,820, mostly from the various trades and occupations of the city. The Art School for women is divided into five departments, drawing, painting (not the kind practiced by some young ladies), photography, wood engraving, and normal teaching. The amount reported as earned for themselves by pupils in the Woman's Art School this year is $9,500. The school of telegraphy has 34 pupils. The average daily attendance at the free reading room and library for a part of the season has been over 3,000. There are 294 newspapers and periodicals on file. From five to six hundred books are daily drawn out of the library and read in the room. There are about 14,150 volumes in the library.

We quote as follows from the Curator's report:

"The Cooper Union grapples with all social ond industrial problems in a very radical way, by promoting the power and the means of their solution, rather than dogmatizing upon theoretical methods. It aims to educate the industrial classes into intelligent skill, as a necessary antecedent to their prosperity and happiness. The theory of the Cooper Union may be said to go further than this. It regards some form of productive and skillful labor as adapted to all capacities, ranks and conditions of men and women; not only as a resource against sudden destitution, or the accidents of fortune, but as promoting individual independence, happiness and true endeavor, worthy of the most gifted intellect and natural endowments. Accordingly, this Institution offers its advantages to the rich as well as the poor, to those independent of paid employment as to those who are so dependent. The Cooper Union cannot be regarded merely as an eleemosynary institution, but as illustrating a great idea—the union of Art and Science with each other and with practical life—the union of productive labor with the refinements, the training and the education that make human life worthy and happy.

Narrow as is the actual sphere, and limited the means of such an institution, the principle and example it sets forth is co-extensive with the wants and interests of the whole country. Its principle underlies Republican institutions and true progress in civilization—the education of the industrial masses.

It is not what the schools and colleges of our land call "ignorance," that threatens the perpetuity of good government or the order of society; but it is the general misery and pauperism that stands ready for every vice and disorder.

A nation educated to skillful work, will also think, feel and act for truth and justice; but a mere scholastic and scientific education may advance us in knowledge, but will not lift us above the reach of abject poverty.

Schools of knowledge will not save this nation from anarchy, but schools of industry.

"What are we to do," says Prof. S. P. Ruggles, "with the army of youths graduating from the public schools? Are they to become tramps, or what?" Can arithmetic, geography and grammar save them from pauperism? Ignorance of all kinds is to be dispelled according to opportunity and the call of our duties; but what kind of ignorance ought to be the first to dispel, and what is the most obvious duty of a man to know?

It is to know how to get an independent living. First learn that, and all other learning may be added.

To be ignorant of geography, arithmetic and grammar may be a misfortune; but not to know how to earn a living is a curse.

In the former trades, crafts and industrial occupations now past and gone, a boy or girl could be turned to account at once as an apprentice; but how are we to apprentice a youth now to a steam engine, a telegraph instrument, or a shoe pegging or shoe cutting machine?"

The work of the Cooper Union is directed to educating young men and women to helping themselves into the means of an honest and respectable livelihood, and has always been a marked success.

THE ELECTRIC LIGHT AND ITS PRACTICAL APPLICATION. By Paget Higgs, LL.D., D.S.C. 8 vo. Cloth, with 240 pages and 94 illustrations. Price $3.50. Published by E. & F. N. Spon, London, and 446 Broome St., N. Y.

This book is divided into thirteen chapters, as follows: Introductory, Lamps or Burners employing the Voltaic arc, Electric Candles and Candle Lamps, Lighting by incandescence, Magneto and Dynamo-electric machines, Mechanical efficiency of Electric Light machines, simple Mathematical considerations concerning the Electric Lighting, Electric Regulators, Commercial aspect of Electric Lighting, Division of the Electric Light, Maritime and Military Applications, Various Applications of the Electric Light, Electric Carbons.

There is no subject, perhaps, that has created such a profound interest in the minds of people generally, as the electric light. The above work is intended to give the reader an account of what has been effected in the numerous endeavors to obtain a practical system of electric lighting. But the details have been confined to those necessary to form judgment of the advantages of each system.

Abstruse discussion has been carefully avoided, and questions have not been raised to which answer could not be found in previous practice.

The labors of Du Moncel and Fontaine, the reports of Tyndall, Houston, Thomson, Deacon, Haywood, and others, have been freely utilized, the object having been to give both *pro* and *contra*.

Much descriptive matter and numerous illustrations have been taken from the author's translation of Fontaine's Eclairage Electricque, now out of print, and considerable indebtedness must be acknowledged to other sources named in the text. Where the author's experience has led him to a conclusion, he has ventured to express it, always stating the reason for the deduction.

There must necessarily be in a technical work of this character, many imperfections. Recent and untried inventions, promising much, cannot be omitted from notice, nor from want of knowledge of detail, can a probably correct opinion be held. Electric lighting is, indeed, so far within its period of infancy that in many cases suspense of judgment is compulsory.

Nearly every week marks an important advance proving the present incomplete state of this branch of engineering. This book contains very little in the way of prophecy, but it is beyond doubt that, in the present we may look for practical, if not great improvements, that will cause in no distant future the adoption of electric lighting for many important, as well as ultimately, for general purposes.

The question of economy is ably considered, and the various adaptations of the electric light, also the process of preparing the carbons consumed by electric lamps.

MANUFACTURES.

Through the courtesy of Mr. Morrell, Secretary and Treasurer of the Hartford Machine Screw Co., we had the pleasure of making a personal inspection of the works of this company a few days since. They are running full of orders, making a great variety of styles and sizes of machine screws, screw tips, bobbins, studs, &c., intended for many widely different uses.

The patent automatic screw making machine, invented by Mr. Spencer, of Spencer Rifle fame, is almost the only machine used by this company, and is indeed a marvel of mechanism. In one room we saw forty of these machines at work, requiring the attendance of only two men, an economy of labor which must be enormously profitable to the manufacturers.

The machine has only been brought to its present state of perfection within the last two years, four sizes being regularly used in the manufacture of machine screws.

Besides the shaping and final cutting off of the screws, four automatic motions complete the entire process of manufacture from the raw material to the perfect screw.

For the purpose of changing any particular machine from one style of screw work to another no alteration is required, further than a simple substitution of one set of the small tools which accompany each machine for another.

Up to the present time, only two or three manufacturers—such as sewing machine companies—have been permitted to make use of this machine, although the owners of the patent are now constructing a baby size, intended for use by the Elgin Watch Co., of Elgin, Ill., in the manufacture of the minute sizes of screws required in a watch.

Coons, Adams & Co.'s Machine Works Finlay, O., are full of orders for their specialties, portable and stationary steam engines, and are employing 20 hands. They have already sent out four mills complete, this year, and expect to turn out not less than 25 engines, which find a market in neighboring States.

The Chicago Steel Works are building an extensive addition to their manufactory.

Work is active at the Cream City Iron Works at Milwaukee, Wis.

The Eagle Iron Works at Bellefontaine, Pa., are to be run to their full capacity.

We are pleased to see such evidences of well-deserved prosperity.

Newton & Cox, manufacturers of twist drill and machinists' tools, Cleveland, O., write us, under date June 28:

Almost everybody in the iron trade is now busy, and many establishments are behind with their orders.

The Harrisburg Car Company have received another order for the construction of 1,050 box cars.

L. S. Graves & Son, of Rochester, N. Y., manufacturers of shoe machinery, elevators, shafting and mill supplies, report an active business.

"We have removed to our new works, Nos. 24 and 26 West street. We have added largely to our plant, and have nearly four times our former capacity."

The machine shops and foundries in Lowell, Mass., are now running full time, with all the hands they can find room for. A year ago they were virtually standing idle.

John Martin's new foundry at Millbury, Mass., which is to be 80×36 feet, has been raised and work is now rapidly progressing upon it.

E. D. Weston, formerly foreman of the Taunton Iron Works foundry, is now superintendent of the large foundry at Wakefield, Mass.

The new foundry and machine shops at Oconomorroc, Wis., have started their machinery preparatory to beginning general work.

The Cameron Steam Pump Works of this city employ 100 hands, and report business first-rate. They recently supplied all the steamers carrying fresh meat to Europe with pumps for their refrigerating apparatus.

The American Watch Co., Waltham, Mass., have stopped for repairs. They are putting in a new 100-horse-power Corliss engine, and re-setting all their boilers with the Jarvis furnace.

Messrs. Riehle Bros., scale manufacturers, of Philadelphia, have received an order from the Russian Government for a testing machine similar to the one recently constructed for the Pennsylvania Railroad Company.

The Brainard Milling Machine Co., of Hyde Park, Mass., are to increase their working force to their full capacity and add to their facilities for manufacturing. They have orders enough to keep them steadily employed until late in the fall.

At Fairbanks' scale factory at St. Johnsbury, Vt., there are orders on hand for nearly fifty 500 hopper scales, and four railroad track scales, thirty tons capacity each, all for use in new grain elevators being built in different parts of the West.

The Ames Company, of Chicopee, Mass., says the *Commercial Bulletin*, are at work on 3,500 feet of steel shafting for the Dwight Company, and are also building for Platner & Porter, of Unionville, Conn., a 94-inch Boyden wheel.

Parsons, Kan., M. K. and T. shop men had a grand picnic to Humboldt, Kan., on the 24th May. Business is brisk in the shops. The general shops of the road are located here, comprising machine, blacksmiths and foundry. The latter department is running ten hours, the former eight. Wages from $2.50 to $3 per day. Yours, DUBLIN.

L. F. Standish & Co., New Haven, Conn., are manufacturing a new automatic gas lighter for Mr. P. Gardner, of New York, and also a cigar lighter to operate upon the same principle. It contains sufficient lighting material for 5,200 lights without refilling, and can be readily refilled at any time at a cost not exceeding the price of a box of matches. A great sale is anticipated.

S. W. Rowell and N. Kellogg have been appointed trustees of the Howe Scale Works, Rutland, Vt. Nearly 250 men are employed. The works were lately removed from Brandon at a large expense for new buildings which was intended to be met by sales of stock. This, however, proved a disappointment. There are two mortgages on the property amounting to $150,000. It is thought that an arrangement will soon be made so the Company can resume business.

The Pratt & Whitney Co., of Hartford, have delivered, since the 1st of April, thirty Spencer automatic screw machines to the Hartford Machine and Screw Manufacturing Company; cutting-off lathes to the Albany & Rensselaer Iron and Steel Co., Troy; Park Bros. & Co., Pittsburgh, and Burgess Iron and Steel Co., Portsmouth; and milling, drilling, and and screw machines, etc., to several sewing machine companies.

Boilers.

From the British Trade Journal.

From the time of James Watt, until quite recently, boilers have been looked upon as mere appendages to steam-engines, necessary, indeed, but more as receptacles for storing up steam than as requiring any ingenuity in their design or mechanical knowledge in their construction; and so long as the pressure was from that of the atmosphere up to 15 lbs. great strength was not required, valves even being placed on the boilers to prevent collapse when the pressure fell below that of the atmosphere. When the use of steam had become an acknowledged success, and promised to extend with great rapidity into all branches of industry, and in all parts of the world, the engine being composed of moving parts, attracted the notice of engineers towards itself, to the complete exclusion of the boiler; and it has up to the present time absorbed more than its fair share of attention.

The first steam-boiler—made probably by the well known Captain Savery—was of the "billycock" shape. This was a weak form, but sufficient for the required purpose. It was used by Watt at the commencement of his experiments, but after a time he gave preference to the "wagon"-shaped boiler, which may yet be seen in some out-of-the-way parts of the country. This he strengthened by stays; but the form was essentially weak, and, in comparison with modern boilers caused extravagance in fuel. The advantages of working steam at high pressure, and expansively, could not long remain hidden, and boilers were soon required which would withstand pressures up to 40 lbs. to 50 lbs. to the square inch; even then the engine was looked upon as the motor, and the boiler as a steam reservoir made sufficiently strong, it not being generally considered that the latter had any effect upon economical steam generation. But of late years the conviction has gradually forced itself upon the minds of leading engineers, more particularly in this country, that there are boilers and boilers, that is, boilers which scarcely deserve the name, and boilers which claim to rank as specimens of engineering, being made on scientific principles, and calculated—

1. To be thoroughly safe in their working.
2. Economical in fuel.
3. Durable, requiring few repairs.

When the demand arose for stronger boilers the first improvement was the externally-fired egg-ended boiler, which is a longitudinal cylinder, with rounded ends, containing no internal flue; but the greatest step both in durability and economy was the introduction of the Cornish boiler by the celebrated engineer Trevithick, the novelties and advantages of which consisted—

a. In the internal flue, whereby the heat is utilized to a far greater extent than was before possible;

b. The flat ends, which were stayed by the tube;

c. And the removal of the hottest part of the fire from underneath the boiler, where the sediment naturally collects, and which is consequently a dangerous part to have near a hot fire.

This boiler was still further improved by the late Mr. Fairbairn in his well-known Lancashire boiler, by adopting two flue-tubes in the place of the one heretofore used. This gave greater evaporative power to the boiler by increasing the grate area. The other improvements consisted in the consumption of smoke through the gases meeting at the termination of the flues; in the greater space underneath between the tubes, giving room for thoroughly cleansing the boiler; and the oconomy of fuel. But although these inventions were great strides towards the utmost economy in fuel, still it was found that the boiler was by no means perfect, being weak in the flue for high pressures, and allowing a great amount of heat to pass away.

To remedy the first defect Mr. Fairbairn proposed rings of T iron to be placed round the furnaces at proper distances, as the flue is strong in inverse proportion to its length, and these rings have the effect of dividing the boiler into so many sections; thus, if two rings are introduced, the boiler is three times as strong as before, and so on. These rings have, however, been ascertained to be liable to crack, even although attached with the greatest care, on account of two thicknesses of metal coming in contact with the fire, and not giving room for the necessary expansion and contraction which are requisite in all boilers.

Flanged seams and bridge-hoops are now universally adopted in first-class establishments, which answer admirably, although care must be exercised in their manufacture. To remedy the second defect tubes were early introduced, mostly parallel; but of late years the cone tubes made by Messrs. Galloway and others have been well received, as it is evident they receive the best heat from the fire, and, if placed by competent men, do not check the draught. Other means have been tried with the same view, such as placing pockets in the flues, but none receive such favor as the tubes. The desire to introduce as many of these tubes as possible, without crowding them so as to check the draught or make the boiler difficult to clean, probably led to the idea of joining the two furnaces behind the fires into one flue, and placing the tubes vertically in this flue. This plan has been tried with several minor differences in form, but the well-known "Galloway" boiler, which, we believe, has been recently improved, may be taken as the type. There are boilers also made with two furnaces, then a short combustion chamber behind, after which a row of loco tubes about 4 feet long is placed, through which the flame passes. These boilers give a great amount of steam in a small compass, and require but little setting; still the loco tubes are apt to spring and leak, and should be avoided wherever possible.

Yet another modification of the same plan is working in the North, and we believe satisfactorily. It consists of a combustion chamber as above, with some of the cone tubes and some of the loco tubes, but all vertical, the heat passing between the tubes. It is quite evident, however, that muddy or limy water would have a great effect upon the loco tubes, which are only 3 to 4 inches diameter, and frequent cleaning and examination are required.

We have gone this much into particulars of the Lancashire boiler and its offshoots, feeling convinced that it is the best boiler that can be put down, considering all conditions; although a complicated boiler, such as those with loco tubes, gives steam economically and plentifully, still where space can be obtained these advantages are completely nullified by the difficulties of cleaning, the inconvenience of leaking and, the frequent repairs, entailing stoppage of work.

Of late years the desire of the principal boiler-makers has been, not so much to introduce new descriptions of boilers or to design improvements upon the old forms, as to secure accuracy and solidity of workmanship, which will defy for a long period the continual strain unavoidable whilst the boiler is working. With this object machinery is made use of wherever possible, as, if properly attended to, errors and imperfections are almost impossible, strength of work is secured, and, as a consequence, great durability. Riveting is done by machinery wherever practicable, for a planed section of the riveted joint shows that machine-work closes up the holes perfectly by the pressure used, whilst hand-work frequently leaves small spaces, the blows from the hand-hammers being insufficient to press the rivet so as to completely fill the hole. Manufacturers in purchasing boilers should take note of this, and should also see that the pressure is not a blow, but a steady push, as the former may burst the plate, or cause the rivet-head to be so insecure as to come off with the slightest disturbance. Few first class boiler-makers now caulk the plates with a narrow edged tool: they plane the edges of the plates to a slight bevel, and close them up with a broad tool. This ensures the edge of the plate being perfectly straight: the rivet-holes are consequently equidistant from the edge, any imperfections existing there are detected, and a neat appearance is obtained. This neat appearance some persons consider unnecessary; but workmen who have a neat and well-made article will, as a natural consequence, take more pride in preserving it intact and in better order. The flues, which were formerly riveted up, are now universally welded, which, when done well, is a great improvement; it insures the perfect circular form of the tube, and when the plates are flanged (which should be also done by machinery) no rivets can exist in the furnaces, consequently the joints remain tight. Those who have inspected riveted flues of boilers will testify that, with a very slight tap with a hammer rivet-heads will frequently drop of, showing that the least increase of pressure would cause a disastrous explosion.

The Engineer of the Boiler Insurance and Steam Power Company (Limited), Manchester, has recently made extensive experiments, which are about being published, the result of which shows that in the longitudinal seams of boiler-shells the double-riveting should be so arranged that the rivet of each row comes opposite the rivet in the other end, not opposite the space between the rivets, as was formerly considered strongest. When these experiments are published we shall doubtless be able to see the reasons for changing the system, and the extra amount of strength which is gained thereby. Steel boilers have frequently been made, but such difficulty was experienced in getting plates of an uniform quality that it fell into disrepute. No fears need now be entertained on this head, as the recent great improvements in steel manufacture enable makers to roll plates of any required length, tenacity, and ductility; they can also be welded with as much certainty as iron, and the advantage of steel is that it is from 30 to 50 per cent. stronger than iron, so that a $\frac{3}{8}$-inch steel shell is quite as strong as a $\frac{1}{2}$-inch or $\frac{9}{16}$-inch iron plate; in fact, steel offers so many advantages that ere many years we may look for it to supersede iron in the great bulk of our manufactures, and steel-makers are now engaged in trials in order that they may turn out steel at the least possible cost.

Few boilers, at any rate those in large concerns, are now worked without being inspected by an engineer of one of the great insurance companies, the three principal of which have their head offices in Manchester. We would recommend all steam-users to have their boilers inspected by one of the companies, and boiler-tenters will find that it frequently relieves their minds of great responsibilty; the cost is, moreover, very trifling, and as the men have such great experience they are enabled to advise in the most awkward cases. The question of pressures is at the present time a vexed one, some preferring to work at 100 lbs. to the square inch, or even higher; others maintain that 70 lbs. to 80 lbs. will give the best result. Theoretically there is a slight gain by using the higher pressures, but practically, considering the great difficulty to keep joints tight, the wearing away of the various working parts, etc., it is doubtful whether the higher pressures are really more economical.

Messrs. Whyte & Co., of Peterboro, Canada, are erecting a branch foundry at Campbellford.

The Cleveland Machine Works, Worcester, are bringing out some new woolen machinery to be ready soon.

Machinists' and Engineers' Supplies.

Trade experiences a lull on account of celebrating the "Glorious Fourth," and there is but little that can be said upon the subject this week. The manufacturers of mechanics rubber supplies held a meeting July 2d, and made some progress towards adopting a uniform price list. It is expected the matter will be settled within two weeks. Many dealers in machinists supplies are out of town.

McMann & Russell, 56 and 58 Gold Street, have in press a new price list and descriptive catalogue of special goods for steam heating, &c., manufactured and sold by them. It contains 25 pages and is fully illustrated.

They give the following new price list of *Russell's Patent Straightway or Gate Valve*:

Double Gates—Brass, ¼ in. $1.50, ¾ in. $1.65, 1 in. $2.15, 1¼ in. $3.15, 1 1-2 in. $4.25, 2 in. $6.25, 2 1-2 in. $11.50, 3 in. $16.00.

Iron Body—Brass Mounted—Flanged or Screwed ends, 2 in. $7.00, 2 1-2 in. $10.50, 3 in. $13.00, 3 1-2 in. $17.50, 4 in. $18.50, 5 in. $26.00, 6 in. $31.50.

Boiler makers supplies continue in good demand. We hear that a new kind of steel plate is soon to be placed upon the market.

The McNab & Harlan Manufacturing Co. of this city are preparing to issue a large new illustrated catalogue and price list. It will be ready some time next fall.

NICHOLSON FILE CO.

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Files and Rasps

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ALSO,

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FILE BRUSHES, FILE CARDS,
SURFACE FILE HOLDERS,
VISE FILE HOLDERS,
STUB FILES AND HOLDERS,
IMPROVED BUTCHERS' STEELS.

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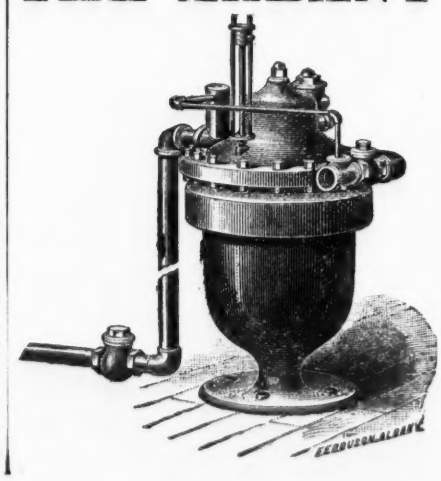

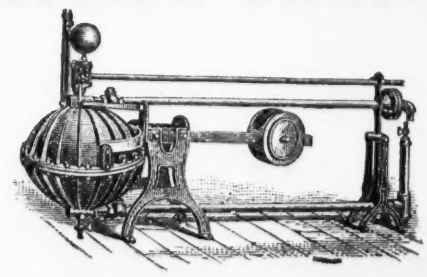

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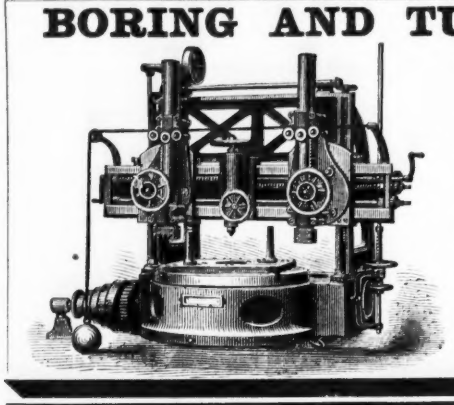

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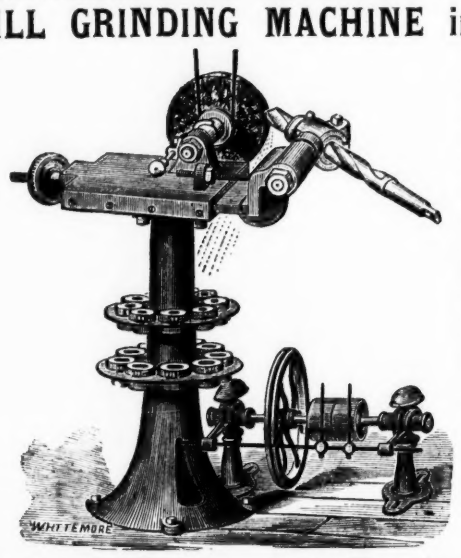

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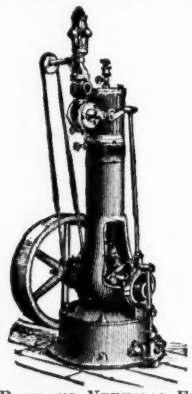

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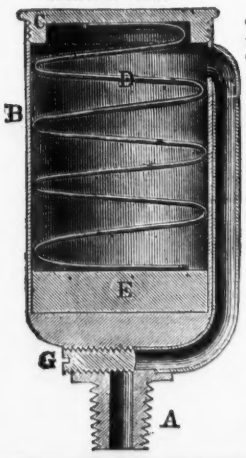

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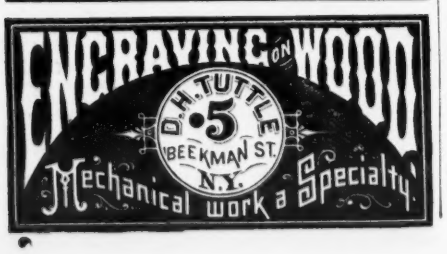

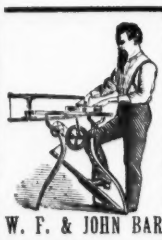

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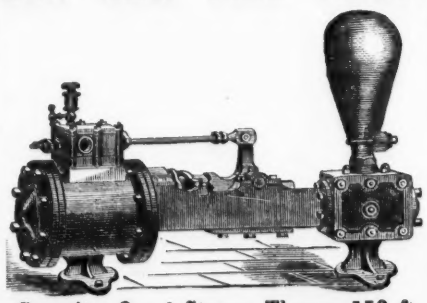

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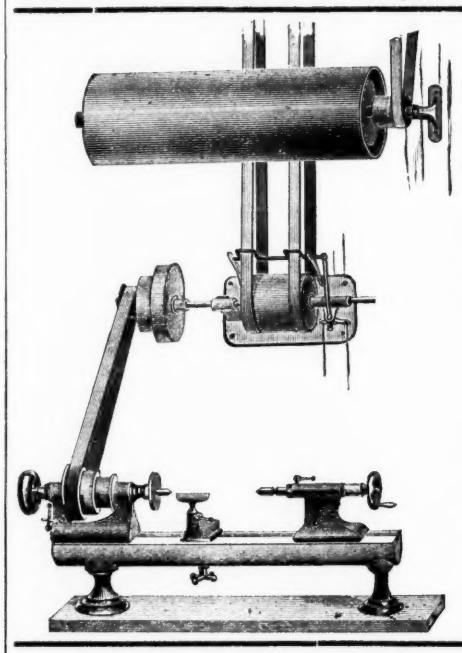

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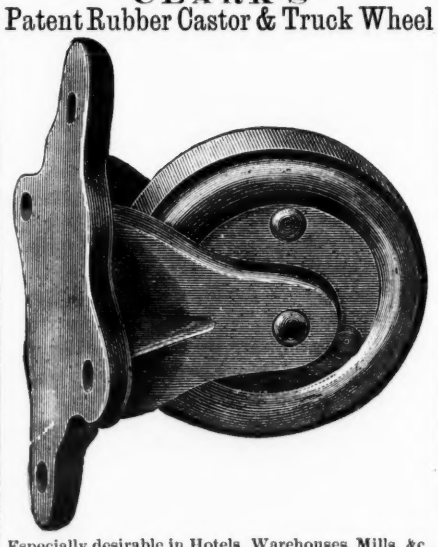

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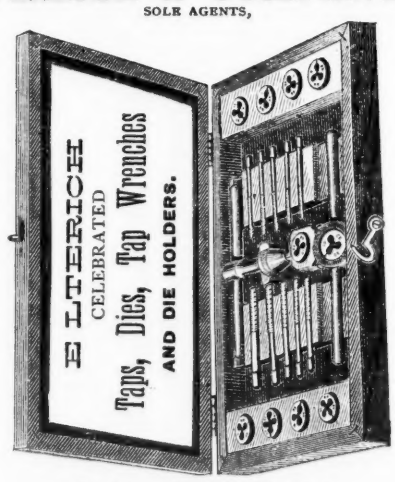

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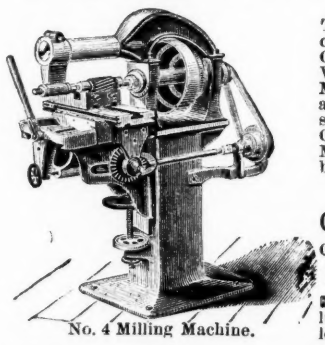

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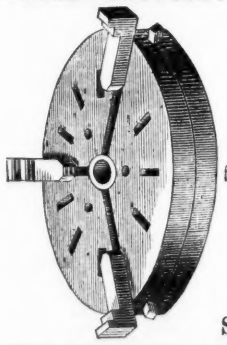

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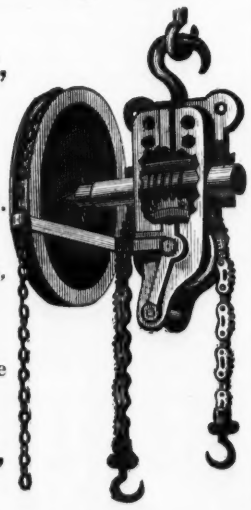

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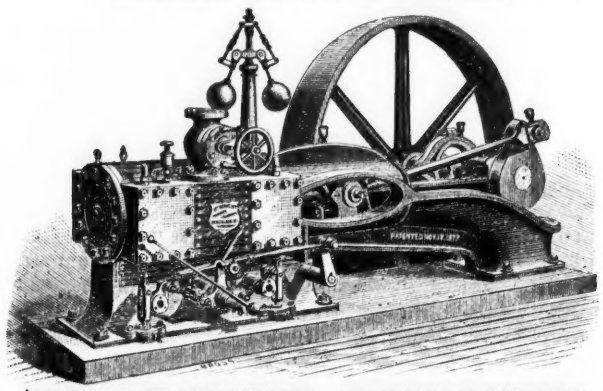

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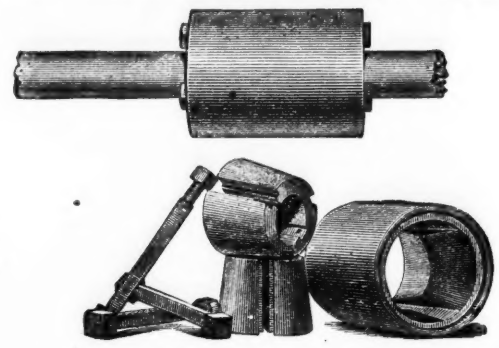

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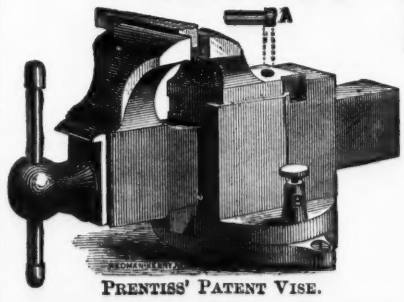

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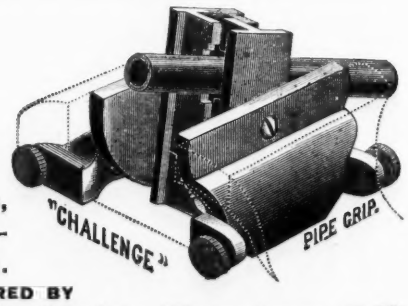

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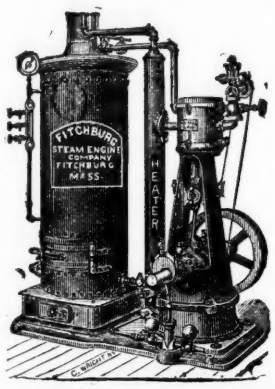

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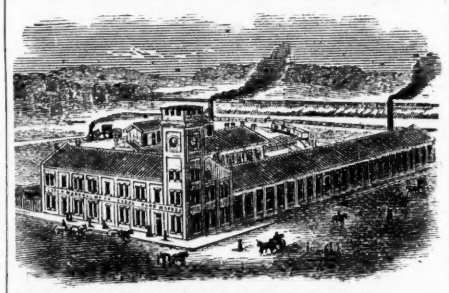

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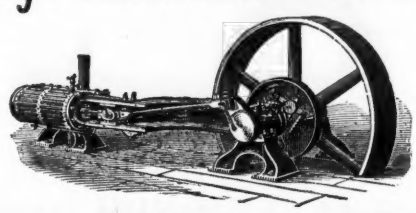

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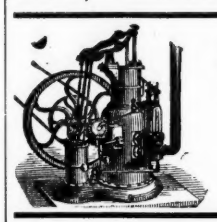

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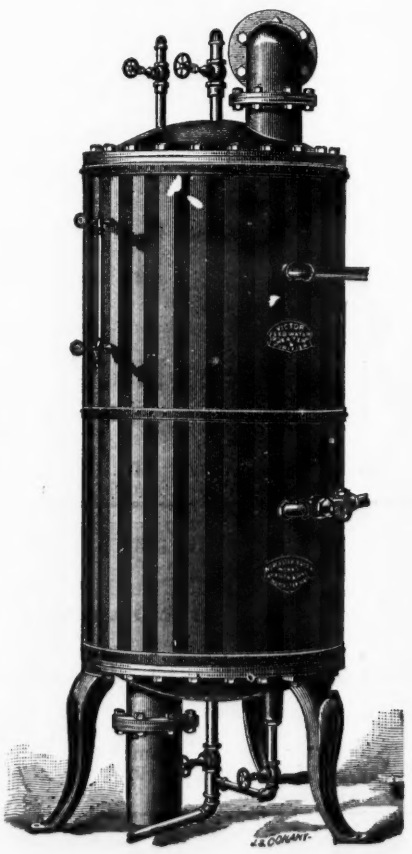

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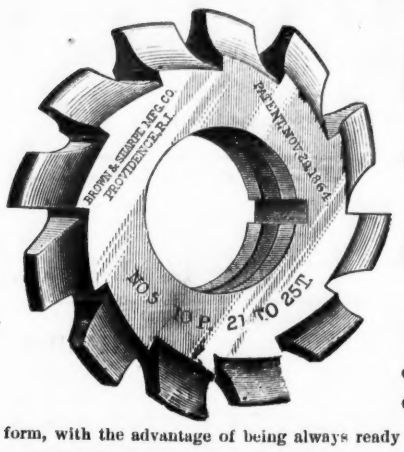

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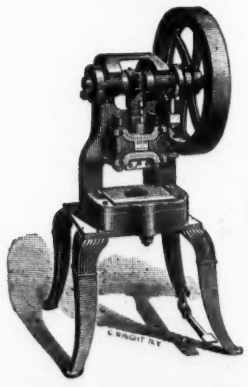

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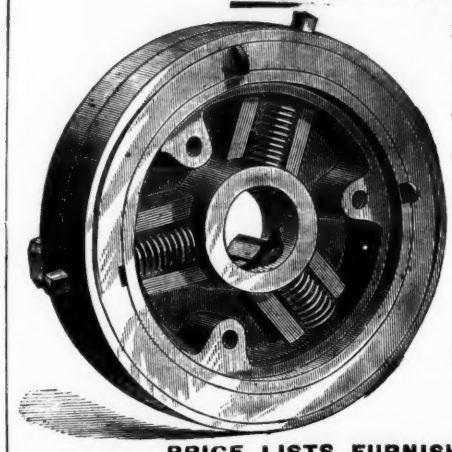

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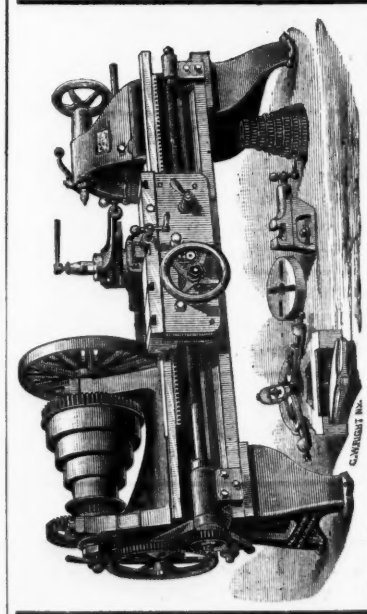

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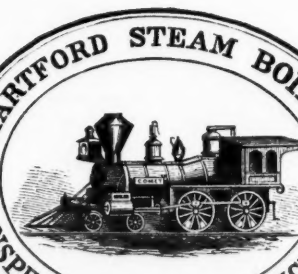

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